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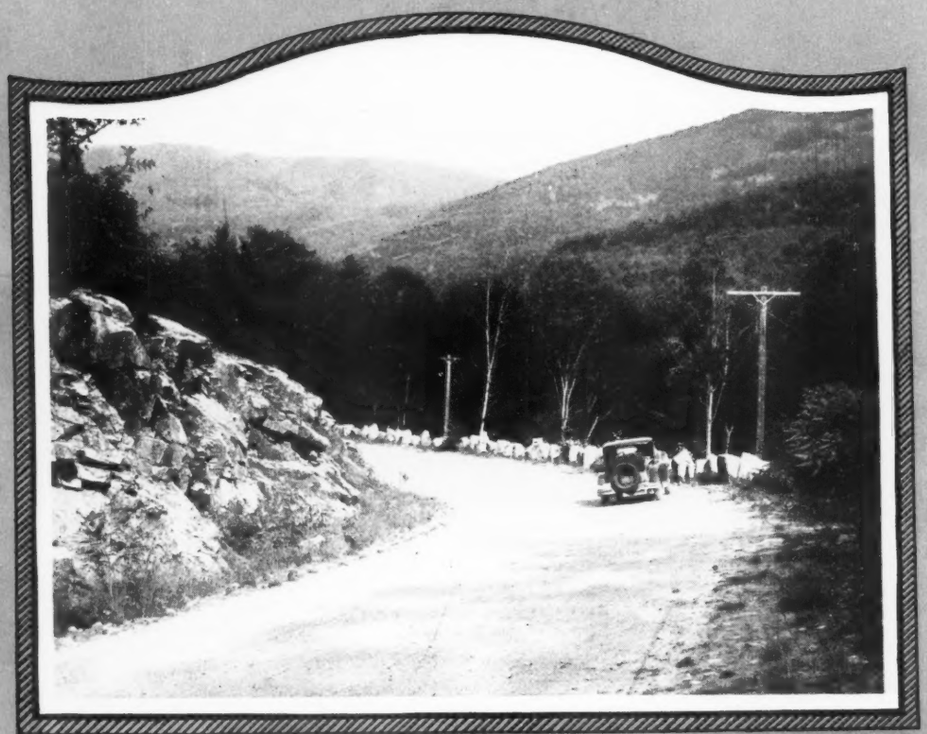

FINE NEW HIGHWAY OVER TONGUE MOUNTAIN ON LAKE GEORGE THAT NOW SUPPLANTS A ROUGH AND LITTLE USED OLD WAGON ROAD

Weaving Felts for Paper-Making Machines
R. G. Skerrett

Mining Limestone for Use in the Making of Beet Sugar
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Scenic Highways Open Lake George From End to End
S. G. Roberts

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Wherever You Go You See Them

Through the desert, over the mountains, across the plains—wherever the trail leads—you will find I-R Portable Compressor outfits in use on the road-building projects of State and Nation.

Miles of fine, paved highways are now being carried through barren and rugged country which was formerly considered impassable. Ingersoll-Rand Portable Compressors, "Jackhamer" Drills, and Pneumatic Tools have played a tremendous part in these undertakings by lowering costs and speeding the work.

See these compressors and tools at Booths B-54 and B-69, St. Louis Road Show, Jan. 10-16, 1931

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As It Seems To Us

FEEDING THE WORLD

SCIENTIFIC pessimists, from time to time in the past, have prophesied that humankind was hastening to a day when there would not be food enough to go around. They called attention to the acreage under cultivation, to the average crop raised per acre, and to the steadily diminishing productiveness of the general y overworked soil. These outgivings have always occasioned at least momentary dismay among the populace; and then the dire warnings have been forgotten, *pro tem* at least. How unwarranted these gloomy prophecies have been, or how the situation has been profoundly changed for the better, was recently summed up in an address by Dr. A. F. WOODS, of the United States Department of Agriculture.

That expert said: "A half century ago it looked to the best scientific minds as if increase in population would overtake and pass our power to produce food to meet the need. The zero hour was set at about 1933. The day is here. Populations have increased at about the ratio figured, but we can feed them all today more easily and cheaply than we could at any time in the past. There is less famine, less suffering, less hard work and more leisure than ever before. The reason is that we have more accurate knowledge of the factors that must be controlled and we control them better than ever before in the history of man".

As the *New York Sun* remarked editorially in commenting upon Doctor WOODS' address, the problem now is not to grow or to raise an abundance of foodstuff but to provide means for its widest distribution so that the plenty of one region may be made available to other sections where there may be a shortage. Many minds and continually improved facilities are furnishing solutions of this problem also.

LET US STAND BACK OF HIM

PRESIDENT HOOVER has said to the Congress that "Prosperity cannot be restored by raids upon the public treasury". And he has emphasized the situation in the halls of Congress by pointing out that leaders of both parties "are playing politics at the expense of human misery". Surely, every serious-minded citizen should ponder well these pronouncements and do his bit towards giving the presidential stand support.

The needy have never cried in vain for help from the people of the United States; and it is not likely now that those either with resources or the power to influence the disposal of resources will hesitate to give whatever aid may be rightly expected in this period of depression which, as we are assured by competent authorities, has reached the hollow of the economic wave. As a nation, we have attained to our world eminence through the unfaltering display of initiative, courage, and the persistent will to accomplish. We should be false to our traditions if we encouraged the adoption of doles as a medium of relief.

What the unemployed need, as well as the farmers who may have suffered through protracted drought during the growing season, is a chance to do such work as they are fitted for in an honest and manly effort to earn money. The funds that President HOOVER has asked for are intended to provide emergency relief in this very manner; and his purpose is not to debauch the spirit of those hard pressed by making them the recipients of charity doled out to them from the national treasury. Mr. HOOVER recognizes that aid of the latter description must, in the end, also be paid for by the people as a whole—thus levying an added tax in perhaps the majority of instances upon shoulders that are already heavily burdened as it is.

It is up to all of us to do our part in preventing raids upon the treasury that may be inspired by those that are playing politics at the expense of human misery; and it is equally our duty to hasten relief along legitimate and self-respecting lines.

The Season's Greetings

AS the New Year dawns, we wish for each and all our readers that their efforts in 1931 may be rewarded with a commensurate measure of success and prosperity.

We feel now, more than commonly, that a greater display of mutuality of interest, a broader recourse to teamwork, will hasten the return of prosperity as we are accustomed generally to gage it.

If we can make the pages of Compressed Air Magazine better able to promote this good work by rendering them more valuable to our readers, we are earnestly desirous of doing so; and we shall welcome any suggestions that will help the Magazine to be more worth while in the months to come.

BIGGER AND BIGGER BRIDGES

AFTER some years of negotiation, final approval has been obtained for the building of the Golden Gate Bridge, by which San Francisco and Marin County will be joined by a steel highway of dimensions outstripping those of any other bridge constructed to date.

Step by step, bridge engineers have advanced, adding to the magnitude of succeeding structures only after those already reared had established conclusively the correctness of their designs. In this way it has been found both possible and practicable to span waterways that had previously been deemed too broad for bridging. When we say too broad, we mean that the waterways were utilized by craft, and that it was necessary to provide ample headroom or clearance while in no wise restricting the channelway. As a general proposition, the suspension type of bridge has lent itself best to meeting the conditions imposed. In the present instance, the physical conditions of the setting offer some notable problems; and among these is the placing of the main piers in waters having tidal currents that run from seven to eight miles an hour.

The projected bridge will have a single deck; and from end to end the structure, *per se*, will be 6,400 feet long while the central span will have the extraordinary length of 4,200 feet! The sustaining towers will rise to a height of 744 feet above low water. At high water the center of the span will have a clearance of 220 feet above the tide. It is estimated that the bridge, soon to be taken in hand, can be finished in the course of four years; and the aggregate outlay has been put at a trifle less than $33,000,000. Certainly, a very magnificent undertaking, and one that will give work to an army of men.

NICOTINELESS TOBACCO

NATURE laid the foundation of a prosperous industry by giving man a "sport" bearing seedless oranges; and plant wizards have since achieved wonders through careful selection and hybridizing. Now news comes from Baden, Germany, of scientists who have found ways to grow tobacco that will be virtually devoid of nicotine. As an outcome of 4,000 experiments, it was ascertained that the nicotine content could be increased or diminished at will by special planting, watering, and fertilizing. Is this the forerunner of cigarettes for babies?

Vista of Lake George from a rock-ribbed and wooded slope on the west shore of that historic and very beautiful body of water.

Scenic Highways Open Lake George From End to End

Left—Looking eastward near the northern limits of Lake George.

Right—A finished section of the scenic highway over Tongue Mountain, near the crest of the climb.

These Routes Will Draw Annually Many More Beauty Lovers to This Picturesque Body of Water

By S. G. ROBERTS

FOR sheer loveliness, Lake George is unsurpassed by any other body of water in the United States; and there are those who declare it is unapproached in beauty. Be this as it may, Lake George is a veritable scenic gem that is placed in a setting of great natural charm composed for the most part of either wooded or rocky hills that in many places rise to towering heights from out of the crystalline depth of the lake.

Year by year, the picturesqueness of Lake George makes an ever-widening appeal to the public, and there is no reason for wonderment that such is the case. We are going to tell what New York State and some of the lakeside communities are doing to meet the motorist more than half way so that the touring sight-seer and summer resident may be able to drive from one end to the other of the lake while following fairly closely the contour of the west shore of that body of water. Before describing the work in hand let us tell something of why Lake George exercises its undeniable lure.

In addition to its fascination to the eye, Lake George grips the imagination both because of its geological genesis and by reason of its intimate identification with critical and even spectacular periods in the history of this country of ours. For the sake of the uninformed, let it be said that Lake George lies in the eastern foothills of the very ancient Adirondack Mountains, and extends in a generally north and south direction for a distance but little less than 40 miles. It varies in width from one to four miles; and it has a reputed maximum depth of 480 feet.

Lake George owes its birth to forces set up during the retreat of the last ice cap that covered the region thousands and thousands of years ago to a depth great enough to cloak many of the surrounding mountains. Before that era, the lake did not exist; and a numerous group of picturesque islands in the southern half of Lake George give mute testimony to the fact that right there, in the dim past, was reared the crest of the watershed that then fed, respectively, the Hudson River on the south and the St. Lawrence River on the north. The ponderous glacial mass ground and plowed its course through that rock-ribbed barrier and, incidentally, reared a bulwark to the south while it carved out the bowl that now holds the wonderfully limpid waters for which Lake George is noted. At the same time, the ice excavated an outlet at the northern end which permitted surplus water from Lake George to find its way into Lake Champlain by a drop of 221 feet over a series of eroded ledges. During a span of untold time, the gaunt and rocky slopes enveloping the lake became weather-worn sufficiently to produce soil that would support vegetation; and therefrom, in succeeding eons, rose dense stands of primordial forests that, in their turn, gave way to the spruce, the pine, and the fir timberlands that greeted the white man when he first penetrated that part of the continent.

No evidences have been uncovered as yet that tell for how long and how far Lake George served the aborigines as a course of travel before the coming of the white man. Undoubtedly, the Indians traversed the lake with their canoes and followed trails trodden by their moccasined feet on the flanking slopes in quest of fish and game or as they journeyed north and south for one reason or another before their movements were influenced by European pioneers. The red man certainly came to use Lake George and its shores more and more when intercourse was stimulated by the presence of the French in Canada and by the Dutch and the British colonists to the southward. The Indians frequented the region when trading with the whites and when allying themselves with the palefaces during periods of peace and throughout the grim years of recurrent conflict.

By the merest chance, Samuel de Champlain missed being the first white man to see Lake George. He was diverted by a battle between his men and the Iroquois near what is now known as the Town of Ticonderoga. The fight occurred on July 30, 1609; and Champlain moved southward over the lake that was afterwards named in his honor. Thirty-three years later, Father Isaac Jogues and two companions were the first of their race to look upon the shimmering waters, which Father Jogues, in commemoration of the day of their discovery, named the Lake of St. Sacrament—a singularly appropriate appellation without regard to date in the church calendar. Gen. Sir William Johnson, in 1755,

Left—Nearing Sabbath Day Point at the northern end of Tongue Mountain Road. Right—Lake George viewed from a hillside in the Township of Hague, N. Y.

changed the name to Lake George by way of complimenting King George II.

Among the Iroquois, Lake George was called *Andiatarocte*, that is, "There Where the Lake Is Shut In". This was inspired by the fact that the lake is enveloped by mountains. The Indians also spoke of it as *Canideri-oit*—in other words, "The Tail of the Lake", which expressed the belief that Lake George was really an arm of Lake Champlain. James Fenimore Cooper, who made Lake George the scene of his book, *Last of the Mohicans*, gave to the lake the name *Horicon*—ascribing it to an Indian source; but authority for this has been lacking. The Indians are also said to have spoken of the lake as "The Silver Bowl", which is picturesquely descriptive of the lake in wintertime when bathed in sunshine.

Historically, Lake George reverberated with the boom of cannon, the staccato of small arms, and the shouts of battling forces during the French and Indian War and, later on, in the Revolution. The Battle of Lake George was fought September 8, 1755, at the southern end of the lake where now is situated the Township of Lake George. The French force, under Baron Dieskau, consisted of 600 Indians, 600 Canadians, and 200 French regulars. They had advanced south on Lake Champlain intending to attack the British outpost at Fort Lyman—later on called Fort Edward; and probably for strategic reasons the French commander turned first toward Lake George, where Sir William Johnson's army of colonists was encamped—resting on its way to try to capture Crown Point on Lake Champlain. The battle that followed was really a succession of three engagements.

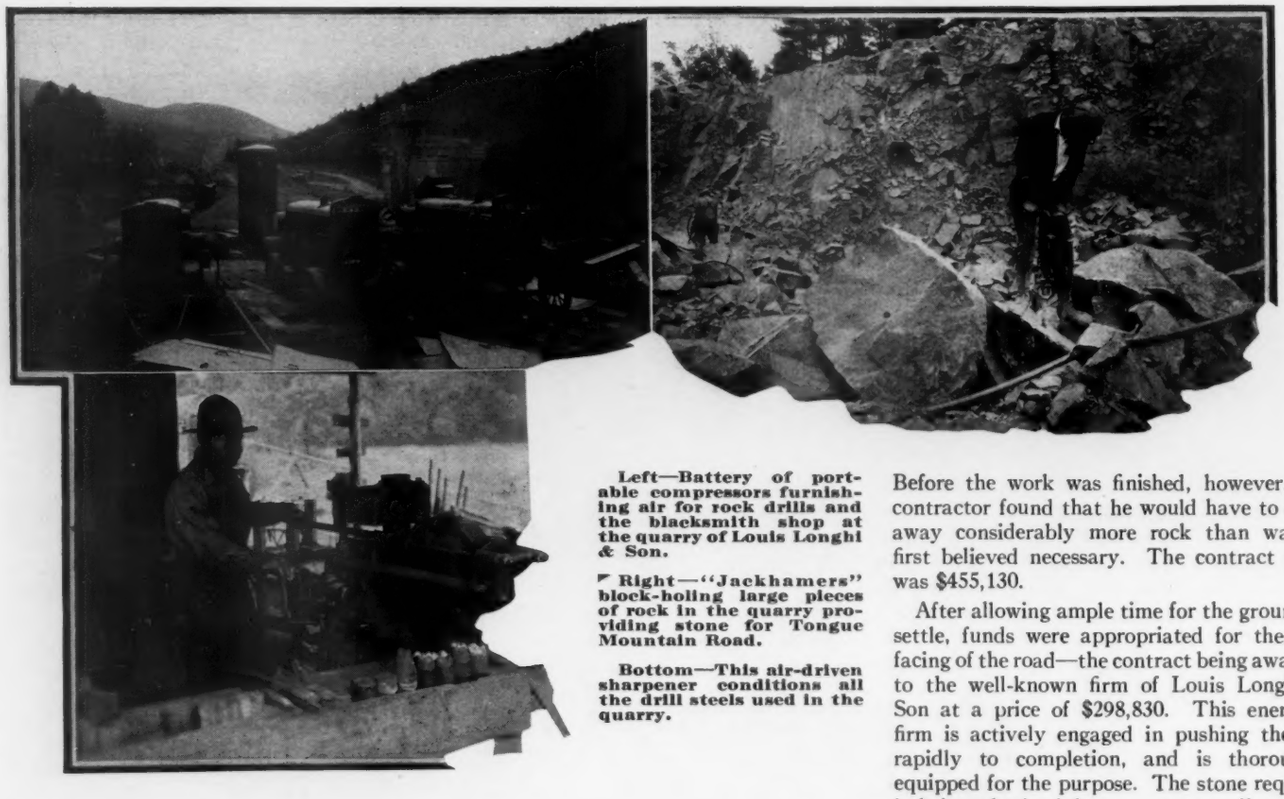
The French took the British force under Colonel Williams by surprise. The British force was composed of 1,000 New England militia and 200 Mohawk allies. Colonel Williams was soon killed and his men forced to retreat; and as they retired they were reinforced by 300 men sent out from the main camp of the English. During the fight, General Johnson was wounded and Gen. Phineas Lyman succeeded in command. British resistance became so strong that the Indian allies of the French hesitated and the Canadians became dismayed, leaving the French regulars to bear the brunt of the action. Nearly all the latter were killed, and Dieskau was wounded and captured. The French casualties numbered about 400, and the British killed and wounded totaled 260, but this sacrifice was offset by the defeat of the French. In August of 1757, Montcalm besieged Fort William Henry, on the southern shore of Lake George, with 6,000 soldiers and 2,000 Indians. The British force, under Colonel Monroe, numbered but 2,300. Failing to obtain reinforcements from Fort Edward, Monroe was obliged to capitulate—Montcalm promising protection to the retiring enemy. Unhappily, the Indians got out of hand and massacred many defenseless men, women, and children, and carried others away into captivity.

Where mountains and timbered slopes lie close to the shores of Lake George.

The British, determined to wipe out the shame of that disaster and bent upon dislodging the French from their fortified position at Ticonderoga, assembled in 1758 near the site of Fort William Henry regulars and provincial troops to the number of 15,000 under the incompetent leadership of Maj. Gen. James Abercrombie. Lake George never before and never since has borne so imposing a flotilla of craft laden with fighting men. The soldiers, stores, ammunition, and artillery were transported in three divisions in no fewer than 1,100 boats of various descriptions. Each division had its own music and unfurled its flags to the breeze of a fair day as the organization moved northward on July 5. From front to rear, the flotilla was six miles long, and as a wounded survivor subsequently wrote: "I never beheld so delightful a prospect". It is not necessary here to detail the battle that followed when the French and the British forces clashed on July 8. All because of Abercrombie's military ineptitude, Montcalm, with only a fourth as many men, was able to defeat his attackers and to impose a loss of 2,000 men. The British fought desperately and courageously despite the strategic blunders of their leader. That victory was the last important success of French arms on this continent. Echoes of strife between contending armies reached Lake George thereafter only from the neighboring watershed of Lake Champlain.

The west shore of Lake George is occupied from south to north by the townships of Lake George, Bolton, Hague, and part of Ticonderoga. Of these, Bolton is said to be the oldest, dating back to 1799. Hague was originally

CHARACTERISTIC BITS OF THE COUNTRYSIDE ALONG THE WEST SHORE OF LAKE GEORGE.



Left—Battery of portable compressors furnishing air for rock drills and the blacksmith shop at the quarry of Louis Longhi & Son.

Right—"Jackhamers" block-holing large pieces of rock in the quarry providing stone for Tongue Mountain Road.

Bottom—This air-driven sharpener conditions all the drill steels used in the quarry.

within the Township of Bolton and attained its community independence in 1807. Rough mountain roads, in places little better than mere trails, sufficed to make intercommunication possible along the west side of Lake George during the long years of the gradual growth of these small communities. Even when the motor car first reached Lake George, travel over the existing roadways was far from comfortable; and, later on, a run from the Town of Lake George to Ticonderoga was ventured only by courageous drivers of high-powered automobiles—the road over the northern end of Tongue Mountain being generally considered too hazardous and difficult. Until the past year, the motorist wishing to see the whole of Lake George found it possible to do so only by driving from the head of the lake to Bolton, there boarding a steamer for carriage to Hague, disbarking at the latter landing, and continuing by road northward to Ticonderoga—reversing this procedure if journeying southward from Ticonderoga.

As an alternative, the motorist could turn inland at Lake George, drive to Chestertown, and then turn north and eastward over the mountains—reaching the lake again at Hague. The popular clamor for an uninterrupted route on the west side of the lake, from one end to the other, led New York State, in 1925, to authorize the construction of a fine scenic highway over Tongue Mountain so as to link Bolton Landing on the south with Sabbath Day Point on the north. Subsequently, both the State and the interested communities voted the building of a connecting motor road between Sabbath Day Point and the already finished highway that joins Hague with Ticonderoga. These two undertakings will be completed in time to meet the peak period of travel next summer.

The contract for clearing away and grading the Tongue Mountain road was awarded C. F. Seabrook Company, Inc., and preparatory operations were started on April 1, 1926. Specifications called for a road 9.77 miles long having a maximum width of 38 feet in cuts and 31 feet in fills. The deepest cut was to be 25 feet. On the south and western slope of the mountain the heaviest grade was to be 10 per cent, while on the north and eastern side the maximum gradient was to be 12 per cent. The job was to be finished in the course of 350 working days over a span of two years. The whole contract involved the excavating of 422,000 cubic yards of earth and rock. Before the work was finished, however, the contractor found that he would have to clear away considerably more rock than was at first believed necessary. The contract price was $455,130.

After allowing ample time for the ground to settle, funds were appropriated for the surfacing of the road—the contract being awarded to the well-known firm of Louis Longhi & Son at a price of $298,830. This energetic firm is actively engaged in pushing the job rapidly to completion, and is thoroughly equipped for the purpose. The stone required is being obtained from a quarry adjacent to the new highway at a point on the northern outskirts of Bolton Landing. A well drill is utilized primarily to remove the rock, and large pieces are afterwards block-holed with "Jackhamers" so that they can be loaded by power shovels for transportation to the near-by crusher. The crusher is electrically driven and has been producing daily on an average of 250 cubic yards of crushed stone. A total of 42,000 cubic yards of stone in place will be required to surface the roadway—entailing the quarrying of substantially 70,000 cubic yards of rock. The rock in the quarry is hard. Air for operating the equipment in the blacksmith shop and for driving the rock drills is supplied by a battery of three Type 20 Ingersoll-Rand portable compressors.

Stone crusher which prepares stone for the Tongue Mountain Road contract of Louis Longhi & Son.

1—Group of three portable compressors which furnished air on the southern slope of Tongue Mountain when the highway was first cut and graded by C. F. Seabrook Company, Inc. 2—Close-up of "Jackhamers" drilling rock during early stage of construction. 3—Steam shovels and caterpillar tractors did fine work in clearing the right of way. 4—Ingersoll-Rand portables and "Jackhamers" at the southern end of the job being built by C. F. Seabrook Company, Inc. 5—Opening up a rocky stretch of the motor highway. 6—Fully equipped open-air blacksmith shop of C. F. Seabrook Company, Inc.

Left—Battery of S-49 "Jackhamers" at work in quarry of Buckley Brothers Trucking Corporation.

Right—This 9x8-inch portable is stationed at the Buckley Brothers' quarry near Sabbath Day Point.

The contract for cutting and grading the connecting highway between Sabbath Day Point and the center of Hague was awarded to Stapell, Mumm & Beals, Inc. They were called upon to relocate much of the road and to carry it well up on the mountainside above Silver Bay and Sabbath Day Point. This relocation measurably increases the scenic character of the route. Again, after allowing time for settling, the contract for surfacing and completing this road, which is 5.9 miles in length, was awarded to the Buckley Brothers Trucking Corporation, of Amsterdam, N. Y. The contract price for this work is $131,000.

Stone for surfacing is obtained from a quarry near the road at Sabbath Day Point; and the job when finished will necessitate the placing of 23,000 cubic yards of stone. The surfaced section will generally have a width of 20 feet. The stone in the quarry has a wide range in hardness, but it is being successfully handled with S-49 "Jackhamers", which drill to an average depth of 12 feet before blasting. The same "Jackhamers" are used to block-hole large pieces of rock to facilitate handling by the two power shovels in the quarry. Three portable compressors supply air for the rock drills and for the blacksmith shop. The adjacent crushing plant, which is driven by internal combustion engines, is a compact and efficient one. Work on the contract was started on May 18, 1930.

Both the Sabbath Day Point-Hague road and the Tongue Mountain road are surfaced with four courses of stone, each 3 inches in thickness. The topmost course is finished with a bituminous emulsion which is put on cold in the sections where the gradient is steep. This produces a granular, non-skidding surface. On the lesser gradients the bituminous material is applied hot. These two roads are said to be the first 4-course macadam highways so far ordered in New York State. The bituminous material is applied in two coats—one constituting the penetration coat and the other the seal coat. Again we see how mechanical aids of different up-to-date kinds are making it possible for contractors to push rapidly ahead despite natural difficulties.

With the completion of these two splendid roads, tourists bound north and south via Lake George and visitors motoring to Lake George as their objective will have not only facilities that will save a good many miles of round-about travel but also a picturesque treat of an outstanding sort. Undoubtedly, many thousands of persons will journey that way henceforth each year.

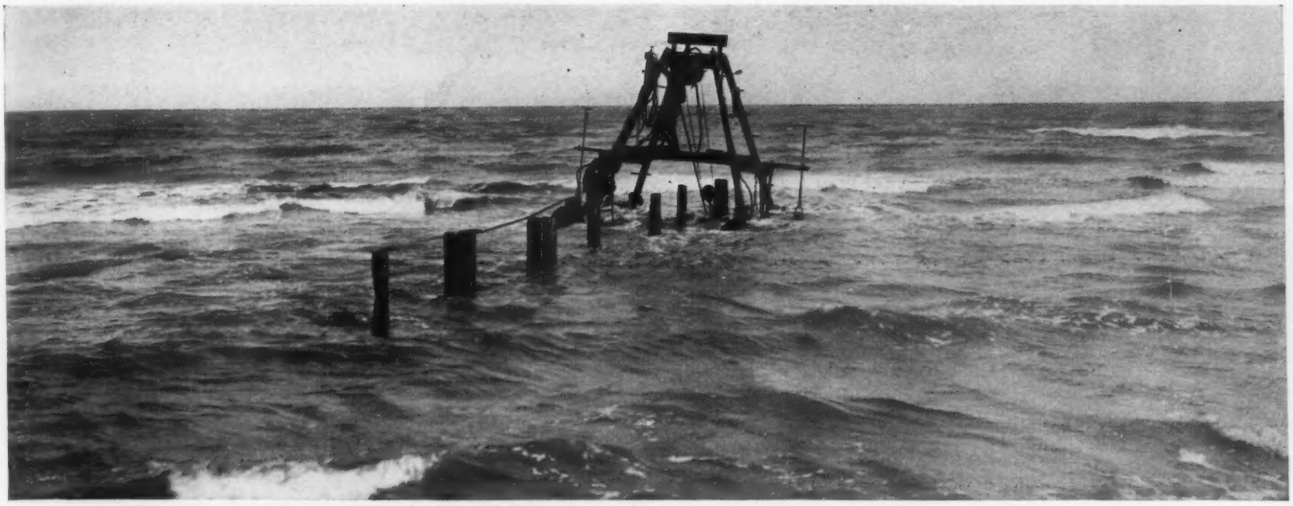
Efficient stone-crushing plant adjacent to Buckley Brothers' quarry.

NAVIGABLE ELECTRIC PLANT FOR NEW ENGLAND STATES

A floating power plant is something of a novelty; but that is what the 7,000 ton steamship *Jacona* is to be. This former cargo carrier is owned by the New England Public Service Company, and is to serve a territory embracing Maine, New Hampshire, and Vermont. Whenever the output of any of the company's hydro-electric plants throughout those states is cut down by reason of low water, the *Jacona* will be dispatched to the most convenient port and there—after water, oil, and electric connections have been made—supply industry in the affected area with power to keep it going.

The freighter is now being converted in the yard of the Newport News Shipbuilding & Drydock Company, where she is being equipped with two General Electric turbine generators and four Babcock & Wilcox oil-fired marine-type boilers. The generators will have a combined capacity of 20,000 kw.

Work on an aerial railway being built across the Harbor of Barcelona, Spain, for passenger traffic is fast nearing completion. It is being run 200 feet above mean low water, and the heavy cable is supported by three great towers. The central one will house a restaurant capable of accommodating 300 people. Each of the four cars to be carried will seat 22, and will make the run of a mile between terminals in three minutes, as against the half hour it now takes to cross the bay by ferry.



Pontoons carrying steel derrick and air hoist making ready to withdraw a pile driven 14 feet into the sand.

Pneumatic Marine Dentistry

By WILLIAM MOLAR

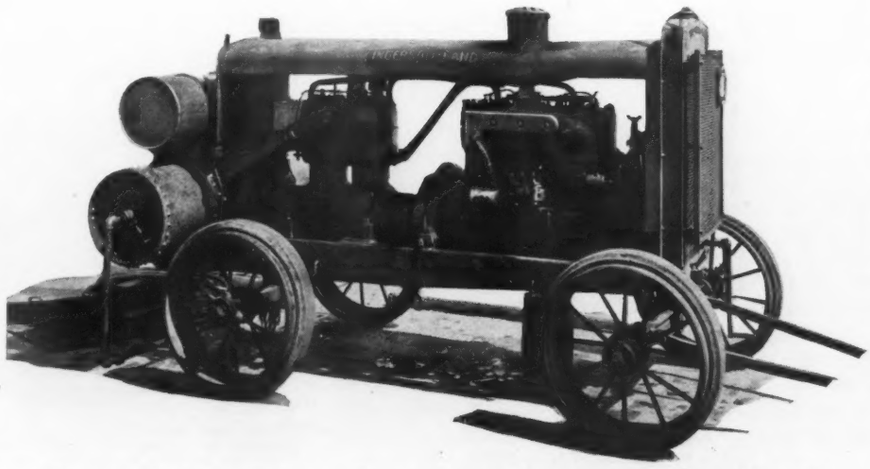
GALVESTON, Tex., has a beach upon the Gulf of Mexico that draws to it many thousands of pleasure-seekers who find there both relaxation and the stimulating excitement of surf bathing. Year by year, the part played by Galveston's beach in the enjoyment of her people grows proportionately with the city's increasing population and the upbuilding of the outlying districts that look to Galveston for aquatic diversions.

In an effort to maintain the valuable asset which she has in her beach, Galveston has had her battle with nature which gave her the wide and sandy stretch and which is equally intent upon moving parts of it away from time to time. Nature, in this case, is impersonated by the erosive and, on occasions, the tumultuous waters of the Gulf. Stormy winds create pounding surfs and strong currents that tear away at the beach and rob it of some of its sand wherever those forceful actions have full play. Therefore, the constituted authorities have concentrated their efforts at strategic points by erecting barriers designed to sap waves and currents of their destructive energy and thus to prevent the displacement of sand and the deformation of the beach.

The means employed at Galveston to check the sweep of wave and current have been a series of wooden jetties, running out into the water at right angles to the beach. The jetties have been formed by driving lines of piles and facing them with heavy planking. This procedure is similar to work done at other places along our seaboards; but in this case the jetties have survived only for a comparatively short while and have failed to perform as it was intended they should. Their collapse has been due to a number of destructive agencies. Wind and wave have appeared to do most of the havoc, but marine borers and the oxidizing or rotting action of alternate exposure to wetting and drying have done much to weaken the timbers. This has been the experience elsewhere.

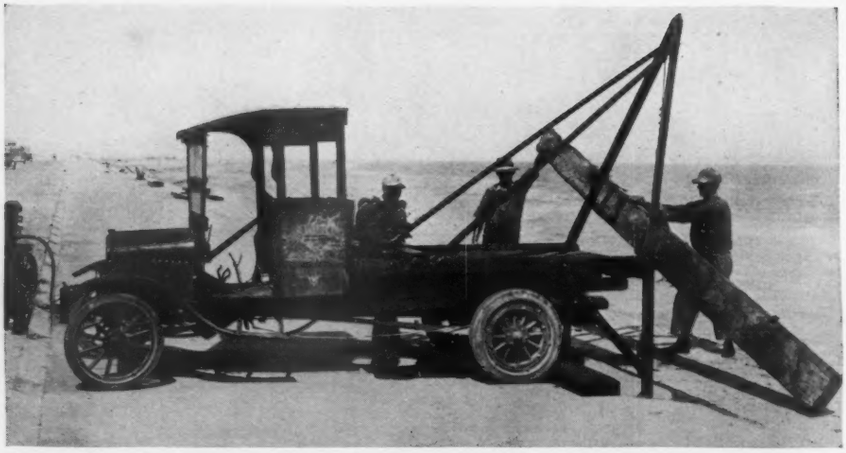
One by one, the jetties have been battered and smashed, and instead of being a defense they have been turned into unsightly menaces to bathers venturing near them. Consequently, the city set about removing the jagged piles. A little over two years ago a contract was awarded to one bidder who proposed to remove the piles at an individual cost of $4.50. That figure was attractive to the city fathers, but the work was found much harder to do than the contractor had imagined. After several unsuccessful efforts to dislodge the piles, the contractor resorted to the use of dynamite to blast them into bits, but the authorities stepped in and halted the procedure before the work had gone at all far. Operations remained at an impasse until the J. J. Kane Boiler Works, Inc., of Galveston, came forward with another proposal to dispose of the piles. The J. J. Kane Boiler Works, Inc., is one of the oldest of Galveston's industrial concerns, and has long been engaged in making boilers and doing marine work.

The Kane Works devised somewhat unusual equipment wherewith to pull the piles bodily out of the sandy sea bed which gripped them firmly. The problem was a twofold one: It was necessary to use some means that would loosen the sand's hold upon the piles and then to apply sufficient force to extract them at the right moment. The apparatus had to be so flexible and mobile that it could be brought into service when circumstances were favorable to their employment. It must be remembered that the work could be carried on only when the Gulf was in a mood placid enough to permit operations, because the jetties project from the beach just where the surf pounds heaviest when the wind blows vigorously. Furthermore, it was essential that the equipment should be such that it could be hauled ashore quickly.



Compressed air for off-shore and sea-wall operations was supplied by a Type 20 portable compressor.

First, a steel derrick was fashioned of 5-inch standard pipe and mounted on two submergible steel pontoons. An Ingersoll-Rand 6,000-pound-capacity D6 air



Air-operated "Utility" hoist, mounted on a motor truck, pulling jetty timbers up on to the sea wall.

hoist was secured at the top of the derrick. The pontoon set was then floated into position over the pile to be withdrawn. Next, the pontoons were allowed to fill and to sink to the bottom. When at rest, the inlet valves on the cylindrical pontoons were closed and compressed air was pumped into the pontoons—the cylinders being about two-thirds full of water. In this way a considerable pressure was built up in the cylinders. When this stored energy reached a prescribed pressure the incoming air supply was shut off and the stored air was utilized to drive the water out of the cylinders—the water being discharged from the outlets of two jet pipes. These pipes, with their active jets, were worked around each pile so as to agitate the sand and thus to reduce its hold upon the pile. When this action had proceeded far enough, the pile was pulled out of the sea bed by the energetic tug of the air hoist—a stout line being secured to the pile for that purpose.

After a pile had been extracted in this manner, all water was blown by compressed air from the cylinders; and the pontoons then rose to the surface and floated so that they could be maneuvered easily into position to deal with another pile. When the weather was favorable it was found possible to pull a succession of piles at an average time of fifteen minutes apiece. With the piles withdrawn it was necessary to drag them shoreward and out of the way. For this work an Ingersoll-Rand DU "Utility" hoist was mounted on a motor truck provided with a derrick. This outfit served to pull the timbers out of the water and up on to the sea wall 17 feet above. Air to operate the pontoons and the hoists was furnished by a Type 20 portable compressor.

After the J. J. Kane Boiler Works, Inc., took over the job, the removal of the unsightly and dangerous piles of the several jetties went on steadily; and in this successful work we have another example of the flexibility of compressed air and its effectiveness in disposing of a difficult problem.

There are said to be 6,582,001 miles of improved highways in the world, and of this total approximately 46 per cent—3,013,583 miles—is in the United States.

BARRY IN WALES AMPLIFIES HER WATER SUPPLY

TO increase the water supply of the Town of Barry, in South Wales, the Barry Urban District Council decided to connect Treforest, near Pontypridd, by pipe line with the reservoir of the Taff Fechan Water Board in the vicinity of Merthyr Tydfil. Work on the project was started at Treforest by Mr. Arthur Seaton, a contractor of Pontypridd, who was awarded a contract for the 3¼-mile section of the system extending from Treforest to Pentyrch. This section has a diameter of 18 inches, and called for both cast-iron and Mannesmann steel pipes. In order to take care of varying pressures it was found necessary to use two thicknesses of cast-iron piping and three thicknesses of steel piping.

At Pentyrch a tunnel had to be driven through an interposing hill. This does not carry the water main but acts as a break-pressure culvert. The Soar Tunnel, as it is known, is of rectangular cross section, 9 feet high and 8 feet wide, and penetrates hard Pennant rock for a distance of 540 feet. It was decided to advance the tunnel from both ends, and, accordingly, the portable compressor, which was relied upon to furnish air for two "Jackhamers", was located on top of the hill. Two air lines, connecting with the compressor's receiver, were carried down the slopes to the opposite portals and into the tunnel as the headings were pushed forward. The portable was a 5½x5-inch Type 20 Ingersoll-Rand machine.

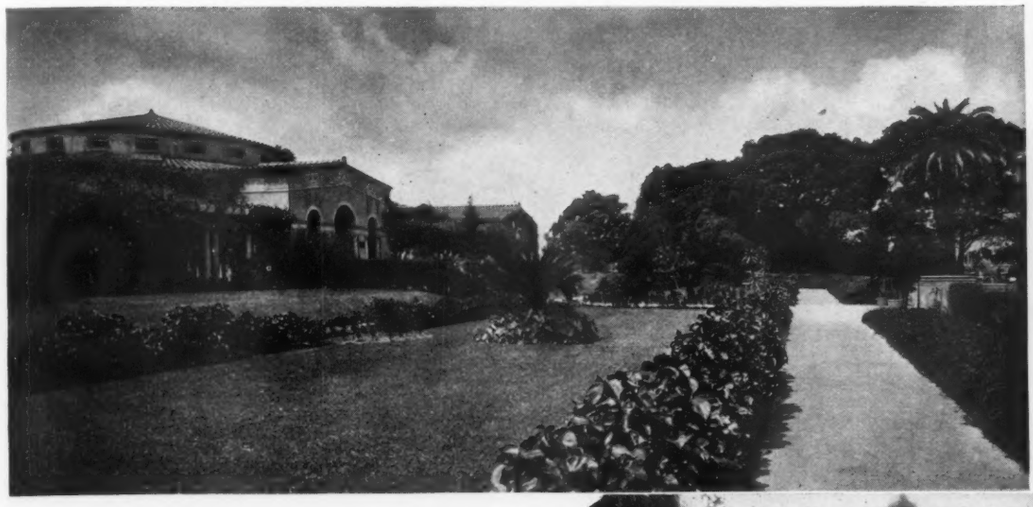
Right from the start the BAR-33 "Jackhamers", although only 28-pound drills, proved that they had ample driving power to penetrate the hard rock encountered. With them it was possible to keep up a steady advance at both ends of the tunnel of 108 feet weekly, representing 288 cubic yards of excavated rock. The work was carried on night and day in two shifts, and this necessitated running the portable without a stop for 22 hours a day and with a 24-hour shutdown once a week from 10 p. m. Saturday to 10 o'clock Sunday night. The rate of progress was so well maintained, owing to the fact that the air-operated equipment functioned without a hitch, that tunneling was completed in five weeks and three days. The amount of rock removed totaled 1,440 cubic yards.

The contract for this 3¼-mile section of the water-supply system was carried out under the supervision of Mr. T. C. Pirie, resident engineer for the contractor.

A sum of $1,000,000 is to be expended this year by the United States Government in the making of topographic surveys. This sum, though many times larger than any heretofore appropriated for this purpose, is to be increased annually in order that the survey of the United States can be completed within the next eighteen years. Under the old program this highly important work could not have been finished in less than 80 years. The availability of accurate topographic maps of all sections of the United States will be of far-reaching value.

Entrance to the Soar Tunnel showing air line leading up the hillside to a portable compressor that supplied air to "Jackhamers" advancing simultaneously from both portals. Mr. T. C. Pirie, resident engineer, is at the extreme right in the picture.

New Orleans Uses Incinerators for Refuse Disposal



Top—New Orleans' fine aquarium in Audubon Park.

Bottom — Tropical plants in Patio Royal.

The Crescent City Has Found These Plants a Satisfactory Solution of a Problem Intimately Linked With the Community's Well-Being

By A. S. TAYLOR

NEW Orleans enjoys a number of nicknames, but probably none describes better the charm of this southern metropolis than that which sums up her many fascinations—"The City Care Forgot". That sobriquet reflects the spirit of the French Canadians who called New Orleans into being and gave to the city a charm that has survived despite the two centuries that have since intervened with their various changes in the government, in the social, and in the civic and business characteristics of the community.

It will be recalled that Sieur de Jean Baptiste Lemoine Bienville founded New Orleans in 1718, carrying there with him and drawing there subsequently compatriots from Canada. As governor of Louisiana for several periods, Bienville lived long enough to see New Orleans attain some of the prominence that he desired for her. After 45 years of French control, New Orleans and Louisiana passed to Spain and then back to France in 1800. The nearly four decades of Spanish rule left its impress upon New Orleans and, while the city and the region became part of the United States in 1803, still, happily, the influence of both France and Spain have survived in a measure up to the present, lending just so much to the lure of the "Queen City of the South".

An enthusiastic scribe has written: "The commercial and industrial history of the Twentieth Century shows nothing to rival the steadfast growth of New Orleans". While other citizens of other communities in this country will undoubtedly take exception to so broad a claim, nevertheless the development of New Orleans has been outstanding during the present century, and especially so in the last ten years. When the 1920 census was taken the population of New Orleans totaled 387,219, while, according to the latest census, the city can now claim a population of 455,792—indicating an increase in the course of a decade of 17.7 per cent.

In no inconsiderable measure, New Orleans has come to be what she is because of her exceptional geographical position. The city is set within a relatively short distance from the mouth of the Mississippi River and in the heart of a region blessed with an extremely rich soil and enjoying a climate that makes it possible to reap enormously valuable crops from those fertile lands. New Orleans is at the bottleneck of the vast areas embraced jointly by the valleys of the Mississippi and the Missouri rivers. Apart from being thus tributary and at the terminal point of 35,000 miles of navigable waterways, the port is the logical outlet for great quantities of raw

Top—Ocean-going steamer on waterfront of New Orleans. Center—Ferryboat plying between opposite shores of the Mississippi at New Orleans. Bottom—Tanker taking on a bulk cargo of molasses.

materials and products originating within the capacious funnel of the associated valleys.

The people of New Orleans are yearly becoming more conscious of their opportunities and of the trade and commercial advantages arising from the city's strategic position near the Gulf of Mexico and within the direct route leading to and from the Panama Canal. It is because of this awakening that the Port of New Orleans has been undergoing continual improvement for a period of years; and its waterfront offers facilities calculated to draw shipping there from all over the world. Apart from the advantages enjoyed because of the Mississippi River, New Orleans is the focal point of numerous radiating railroads. Accordingly, the city stands forth as a great shipping center, as a port of entry, as a cotton market, as a sugar and rice market, as a manufacturing center, and as a financial center.

The visitor can readily grasp why the people of New Orleans are so proud of the municipality. New Orleans has been quite justly described as distinctly a city of homes and as an unsurpassed place of residence. It basks in an abundance of sunshine, and it can boast the prevalence of flowers the year round. To the intimate charm of her floral life is added the dignified touch of stately oaks and innumerable magnolias that fill the air with their perfume during the season of their blossoming. In the "French Quarter" are to be found residences of a quaint, old-time type of architecture, with their wide, paved courtyards shaded by palms and other semi-tropical plants.

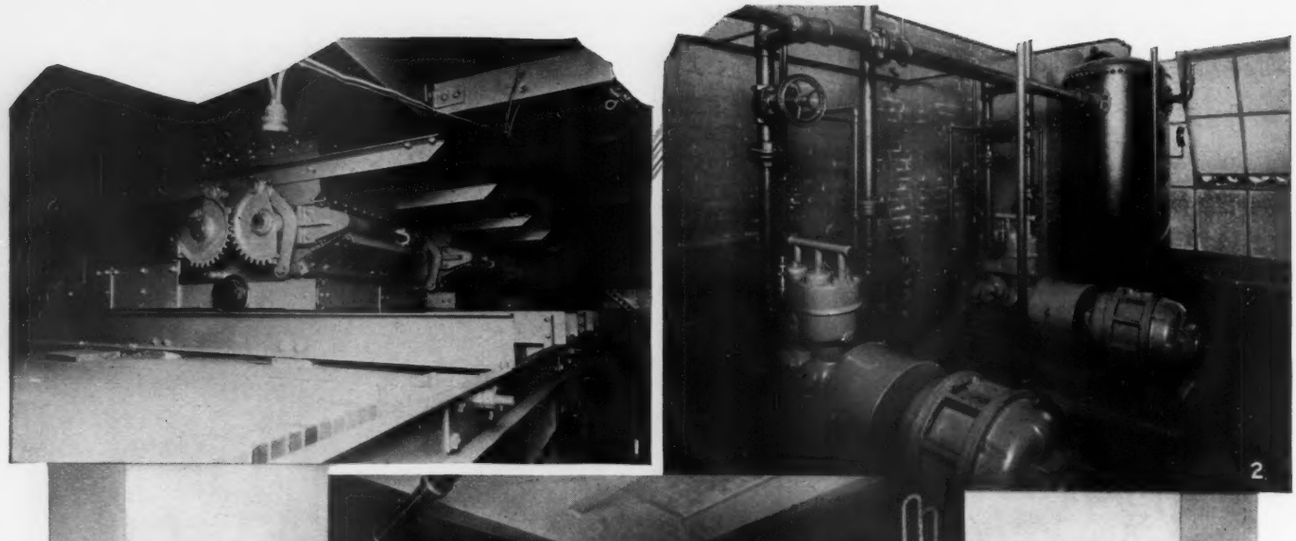
Nature has apparently done her utmost to enable man to make New Orleans preëminent in the region she occupies; but, despite this bounty and a balmy climate, hygienic conditions in the past have at times been none too good, and yellow fever has taken its toll more than once. New Orleans' commercial development was long handicapped until the responsible authorities began taking those steps that have since profoundly altered the sanitary status of the community. Today, New Orleans sets a commendable example to many other cities in the ways she safeguards the health of her people and of the visitors within her gates. It is with one of these efforts that we wish to deal in this article. We refer to the facilities employed by New Orleans in the speedy and the sanitary disposal of garbage.

Mr. J. L. Reilly, deputy commissioner, has charge of this important work; and in his report for 1929 he has described how the system is organized and operated by the Division of Public Works. For the most part, household wastes and like refuse from markets, hospitals, hotels, etc., are collected in covered vehicles and hauled to one or the other of five incinerating plants situated at points where they will best serve the several districts concerned. These incinerators provide efficient means of garbage disposal save where the term includes tin cans and certain sorts of incombustible trade wastes. For the present, refuse materials of this nature are used to fill old drainage canals and other available areas—a situation which Mr. Reilly points out is far from desirable. The same problem exists and persists in a large percentage of American cities.

New Orleans' five incinerators are officially designated by the letters A, B, C, D, and E. Incinerator A was constructed in 1916, and incinerator D was built in 1922. Our present interest is in incinerators B, C, and E, which

New Basin Canal which joins Lake Pontchartrain with the Southern Yacht Club, at the left.

1—St. Charles Avenue with its beautiful overhanging oaks. 2—A typical bit of the famous old French Quarter of New Orleans. 3—Fine colonial home on St. Charles Avenue. 4—In the palm-shaded grounds of Holy Name Church. 5—Canal Street, looking toward Lake Pontchartrain. The people of New Orleans are rightly proud of this splendid thoroughfare.



1—Charging machines which are operated by means of compressed air. 2—Type 20 compressors which alternately furnish air to operate the charging machines. 3—Furnace No. 1 in Incinerator Plant C.

were erected recently and are typical of the most modern practice in this field of sanitary engineering. These plants were designed, reared, and equipped by the C. O. Bartlett & Snow Company of Cleveland, Ohio; and we are indebted to that organization for the following details:

The three new incinerators for the destruction of the city's refuse were placed in operation during the latter part of 1929. Their total rated capacity in sixteen hours is 350 tons—the capacities being 150 tons each for Plants B and C and 50 tons for Plant E, all based on a 16-hour working day. Plant E is so constructed that the building can be extended in the future so as to accommodate an additional incinerator unit, thereby doubling its capacity.

The incinerator equipment of Plants B and C consists, in each case, of two 4-cell Sterling furnaces, while Plant E has a similar furnace of the 3-cell type. Each furnace at Plants B and C has an individual chimney to which it is connected by its own flues. A forced-draft fan, preheater, and other auxiliaries are furnished complete with each furnace. When Plant E is enlarged in the future, the same independent equipment of each furnace will be carried out.

The city refuse is collected in covered steel skips or containers, which are carried on trailers—two skips per trailer. On arriving at the plants, the containers are hoisted from the trailers, one at a time, by means of overhead traveling cranes and are either dumped directly into the furnace charging hoppers or, in case the hoppers are all full, are stored on the charging floor ready for dumping. In the latter case the crane picks up an empty skip for the full one and deposits it on one of the waiting trailers, which then proceeds on its way of collecting refuse after two such empties have been returned to it. Trailers are brought in in trains by tractors or mules, and pass over scales before the containers are taken to the charging floor. Each of Plants B and C is equipped with two such traveling cranes and Plant E with one.

The furnaces are of the mutually assistant cell type of construction and operate on the high-temperature principle. Each cell or grate has an individual charging machine, the operation of which is under the control of the stoker. The charging mechanism is placed on top of the furnace and is actuated by compressed air. When the stoker desires to charge a furnace he opens an air valve, and the mechanism automatically opens first the charging door, which is in the top of the furnace, and then the gates in the bottom of the charging hoppers—the refuse dropping through the charging hole in the main arch down on to a drying hearth in the furnace. By the reverse operation of the valve the stoker closes the hopper gates and the charging door, thus putting the mechanism again in readiness for reloading the hoppers. The refuse from the drying hearth is stoked on to the active grate area by hand.

The products of combustion pass from the grates to the combustion chamber and thence to the chimney direct, or via the preheater where a portion of the heat in the flue gas is recovered by transfer to the incoming forced draft. The forced draft is delivered through ducts, below each grate, after passing through the preheater. Each grate is separately controlled by means of a butterfly damper according to the requirements of the fuel bed. Main flue dampers and preheater flue dampers regulate the proportion of flue gas passing through the preheater tubes and thereby control the temperature of the incoming forced draft.

Ashes and clinker are pulled off the grates and dropped through holes in the stoking floor directly into steel cars which operate on tracks and are lined up in a tunnel, below. In Plants B and C these cars are handled by platform elevators and dumped into elevated bins—the ashes subsequently being carried away by trucks. In Plant E the ashes are dumped from the cars into a skip set in a pit—the overhead crane picking up the loaded skip and placing it on a trailer for delivery to a dump.

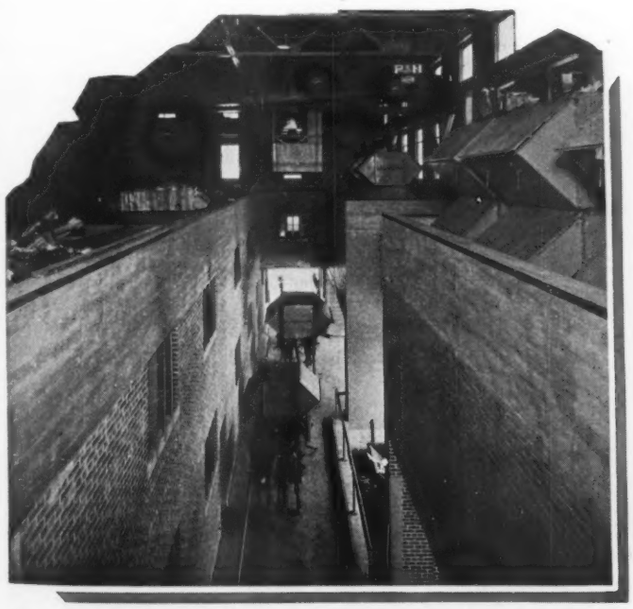
The three plants just described, including the purchase price of the property upon which they stand, cost approximately $780,000. The service rendered by them—a service that is performed every day—calls for an outlay of about $1 per capita per year or, expressed

otherwise, only 1½ cents per household *per diem*, according to the figures given by Deputy Commissioner Reilly. This is certainly a moderate price to pay for the benefits accruing from that system of garbage disposal.

Mr. Reilly emphasizes the need of fuller coöperation on the part of the public through the general use of watertight, covered, metal receptacles. As he puts it: The city government has done its part and, because of that, the municipality is in a position to set up and to enforce regulations which are necessary to still further improve the service. The example set by New Orleans can well be followed by other populous centers that have a similar problem.

There probably are among our readers some that are conversant with garbage-disposal methods both in this country and abroad, and these will no doubt note that, in the case of New Orleans, the heat developed in burning the refuse is used only to preheat the garbage in advance of feeding it to the fire beds. In some European disposal plants, especially, operating economies are obtained by utilizing the heat to generate steam for local power purposes. Also, the ashes in certain of the foreign plants are made into brick that have a ready market. Neither of these things is done at the New Orleans incinerators, and the curious may ask why not?

The purpose in establishing incinerators in the Crescent City was primarily to provide means of further safeguarding the health of the community, and, therefore, sanitation rather than economies was the first thought on the part of the responsible city officials. Next, the desire was to erect and to equip incinerators at strategic points—in populous sections of the community—where their operation would cost least and, at the same time, not prove objectionable to neighboring residents. The type of equipment chosen for the new incinerators is, therefore, the result of much forethought, with particular regard to the sanitary needs of New Orleans.



Looking down into the delivery driveway of Incinerator Plant C.

The old French Market, one of the famous landmarks of New Orleans.

As they stand today, Plants B, C, and E are being operated far below their rated capacities, which are for a continuous 24-hour period; and this means that these incinerators will be able to take care of any increased demand due to municipal growth for a goodly number of years to come. This vision on the part of the city fathers will bring its own reward in the course of time.

RICH COPPER FIND IN CANADA

SUCCESS would seem, at last, to have crowned efforts, made intermittently since 1769, to discover what were persistently rumored to be fabulously rich copper lands in the vicinity of Coronation Gulf on the Arctic Coast of Canada. The latest of the prospecting parties to venture into this barren and isolated region reports not only the finding of copper but the existence in the Coppermine River region of large tonnages of high-grade ore.

According to *The Northern Miner*, seven separate deposits were located as the result of intensive and systematic prospecting. Most of these appeared to be rich but not large. The biggest strike was made 40 miles west of the Coppermine River and about 50 miles inland from Coronation Gulf. There, outcroppings revealed a massive bornite formation running through a draw having a width of about 30 feet. The indications are that the ore body continues the length of the draw, as the copper-bearing ore has been uncovered at different points explored by trenching. If this be true, then the prospects are that that far northern region may become of first importance in the Dominion as a copper producer. Channel samples taken across one 12-foot section of bornite showed an average of 46.99 per cent copper. This is a high percentage for an ore body of such width.

The use of airplanes has undoubtedly made it possible for the present prospectors to succeed where others failed. Just what the outcome will be remains to be seen. But certain it is that the country will be opened up if the tonnages are such as to warrant connecting it with the outside world by suitable rail or water routes. This is entirely feasible, as ocean-going vessels now approach within 50 miles of the Coppermine River district, while the Mackenzie River and Great Bear Lake route offers another means of transportation.

ANTHRACITE FROM BITUMINOUS COAL BY NEW PROCESS

BITUMINOUS coal is being converted into anthracite by a system developed by Clarence S. Lomax, a chemical engineer. He claims, after eight years of experimenting, to have discovered a process that does in a few hours what it has taken Nature millions of years to accomplish. If this be true, then Mr. Lomax will have solved a problem that has so far defied other investigators. While different methods have been developed, yet none has been of a kind to produce fuel resembling anthracite on a commercially practicable scale.

A plant is now operating in Chicago where Mr. Lomax' process is in use. The plant has a daily capacity of 600 tons, and is to be enlarged as the demand for the product increases. In its original state the bituminous coal handled there has a volatility of 36 per cent; but after it has been carbonized and has become a high-grade anthracite its volatility is 12 per cent. The coal treated in the Chicago plant comes from Illinois and Indiana mines.

Plans have been approved, according to dispatches from London, England, for the building of a new $18,000,000 vehicular tunnel under the River Thames. It is to have a roadway 19 feet wide, with sufficient headroom for double-deck omnibuses, and is to connect Purfleet and Dartford. Work on the project is to be started early this year with the driving of a 12-foot pilot tunnel. The object of this is to determine the geological conditions along the proposed route. It is estimated that it will take 3½ years to complete the undertaking. The tunnel is designed to facilitate traffic between Kent and Essex, which are at present linked by ferry.

F. B. Drake

SOCIETY FOR STEEL TREATING ANNOUNCES NEW OFFICERS

AMONG the names of the 1931 officers and directors of the American Society for Steel Treating, recently announced, are two new ones—F. B. Drake, of the Johnson Gear Company, and B. F. Shepherd, chief metallurgist of the Ingersoll-Rand Company. Both men have been made national directors to serve for a period of two years. Mr. Drake is a member of the executive committee of the Golden Gate Chapter, and has for several terms been president of the California Metal Trades Association. Mr. Shepherd has also been an active member of the American Society for Steel Treating, and his present appointment comes after two years of service as secretary and two years as chairman of the Lehigh Valley Chapter.

Mr. Shepherd has presented able papers before the Society on several occasions—his most recent one, on his impressions of Europe, following an extensive trip that he made abroad in the interest of his company. He is scheduled to read a paper on some phase of the heat treatment of steel during the course of the Western Metal and Machinery Exposition, to be held in San Francisco, Calif., from February 16 to 20. Twelve other national engineering organizations, including the American Society for Steel Treating, will meet there at the same time and coöperate to make the event a success.

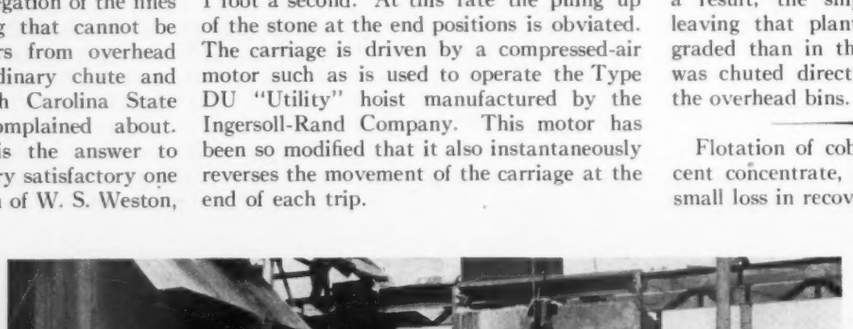
The full list of the present officers and directors of the American Society for Steel Treating is: President, J. M. Watson, metallurgical engineer Hupp Motor Car Corporation; vice-president, A. H. d'Arcambal, consulting metallurgist and sales manager of the Pratt & Whitney Company; secretary, W. H. Eiseman; treasurer, A. Oram Fulton, president Wheelock, Lovejoy & Company; and directors, F. B. Drake, Robert G. Guthrie, O. E. Harder, W. B. Coleman, and B. F. Shepherd.

B. F. Shepherd

AIR-OPERATED CAR LOADER GRADES CRUSHED STONE

THE Weston & Brooker Company quarry, at Columbia, S. C., is reputed to be the source of a number of plant improvements that are calculated to facilitate operations in one way or another. These are finding favor elsewhere in the crushed-stone industry, and include the Weston crusher, a sample screening apparatus, and a mechanical device for loading the finished product into standard-gage gondolas. The virtue of the last and newest equipment developed there is that it prevents the segregation of the fines and the coarse, something that cannot be avoided when loading cars from overhead bins by means of an ordinary chute and something that the South Carolina State Highway Department complained about. The air-operated loader is the answer to these complaints, and a very satisfactory one at that. It is the invention of W. S. Weston, mechanical engineer for the Weston & Brooker Company.

The combined loader and spreader, for that is really what it is, consists in the main of two steel boxes suspended one beneath the other from a 4-wheel carriage that travels on an overhead runway extending under the chute and at right angles to the track. From the upper and larger box, which is spotted below the chute, the stone is fed through two openings, 14 inches square and 30 inches apart, into the lower container, whence the material falls through corresponding openings into a car—the spreader traveling the while back and forth the 5-foot width of the car at a speed of about 1 foot a second. At this rate the piling up of the stone at the end positions is obviated. The carriage is driven by a compressed-air motor such as is used to operate the Type DU "Utility" hoist manufactured by the Ingersoll-Rand Company. This motor has been so modified that it also instantaneously reverses the movement of the carriage at the end of each trip.



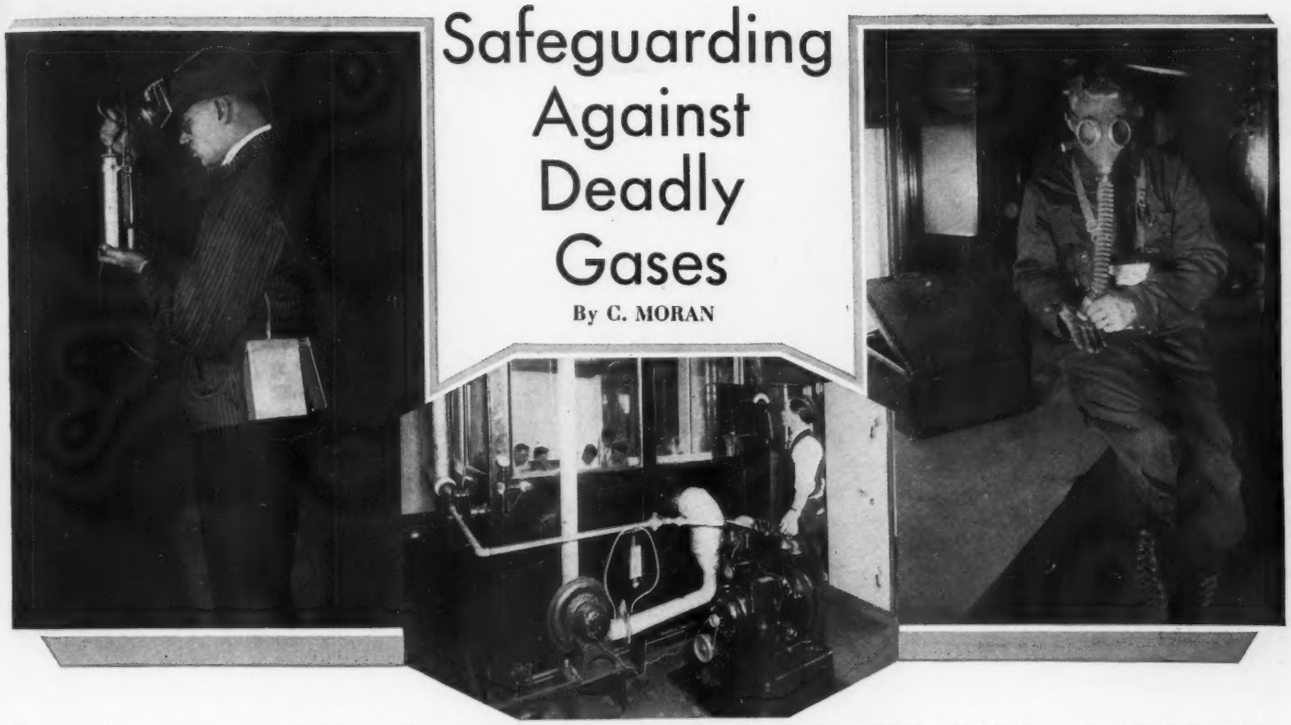
The air-operated car loader in action. The device shuttles back and forth across the car thus effecting a more uniform distribution of the coarse and the fine stone than by the ordinary method of dumping.

The automatic loader is now a part of the regular equipment in daily service in the Weston & Brooker Company quarry; and, as a result, the shipments of crushed stone leaving that plant are far more uniformly graded than in the past when the material was chuted directly into waiting cars from the overhead bins.

Flotation of cobalt ores yielding a 20 per cent concentrate, and with a comparatively small loss in recovery, is now said to be possible as a result of developments in the chemical branch of the mining industry. According to D. H. Halford, who has been experimenting with cobalt ores in the Canadian Mines Branch Laboratories at Ottawa, the bulk of the cobalt has been produced as a by-product of silver. In the ordinary treatment of silver a large proportion of the cobalt is lost, concentrates running only as high as 6 or 7 per cent, with recoveries around 50 per cent. By the use of the new reagent, called "flotagen", the ore is made to yield twice as much cobalt.

Safeguarding Against Deadly Gases

By C. MORAN



Left—Apparatus used to determine amounts of poisonous gases in the air. Center—Human subjects undergoing test in a so-called lethal-gas chamber. Right—Gas mask that supplies breathable oxygen for a period of two hours.

A dozen men reported to the "sick room" of a soap factory. They had suddenly become ill at their machines. Investigation disclosed a leaky canister of hydrogen—a colorless, odorless, and tasteless gas that becomes highly inflammable and explosive when admixed with air. It is used in the hardening of oils, fats, and soaps, and in torches for welding and cutting metals.

The problem of how to safeguard workers from so-called deadly gases required in the manufacture of many commodities is being attacked by Government scientists in cooperation with commercial research agencies. More than 2,000 samples of gases—ranging from hydrogen cyanide, the most noxious gas known, to carbon dioxide given off by animals and human beings—have been collected and are being analyzed.

Industrial plants, poorly ventilated workshops, tunnels, mines, theaters, and other public gathering places have been visited by these scientists who have taken samples of gases suspected of causing illness and even death. Various types of apparatus have been used for this purpose—the simplest of these being a vacuum tube, the tip of which is broken after a file mark has been made on one side of the neck. Gas immediately enters the opening and fills the tube, which is then sealed by forcing a prepared wax into the opening.

The gases are classified as "anaesthetic", "irritant", or "toxic". The anaesthetics include acetylene, butane, ethylene, ethyl chloride, methyl chloride, nitrous oxide, and propane. These exert a druglike action when breathed, as they are absorbed by the blood. They may cause death when inhaled in considerable quantities. Irritants are ammonia, chlorine, and sulphur dioxide, gases which are not absorbed by the blood but which injure the surface tissues of the respiratory passages. Death may result from continuous exposure because of the contraction of the respiratory tract. Toxic gases, such as hydrogen cyanide, are poisonous. They affect the body tissues and prevent them from absorbing oxygen from the blood. Many other gases—such as carbon dioxide, helium, hydrogen, nitrogen, and oxygen—are classified as harmless when breathed in small quantities; but they may induce death from suffocation when inhaled in large doses because, like the toxic gases, they prevent oxygen from reaching the blood.

What the scientists hope to do is to develop mechanical apparatus that will sound an alarm automatically whenever gases in menacing or lethal quantities are present in factories and other places, and that will simultaneously release counter-irritants to neutralize the deadly gases. This has been done in the case of carbon monoxide, which is produced through the incomplete combustion of gasoline, oil, illuminating gas, or coal. The automatic recorder and alarm devised begins to function the moment the percentage of carbon monoxide in the air is such as to endanger human life.

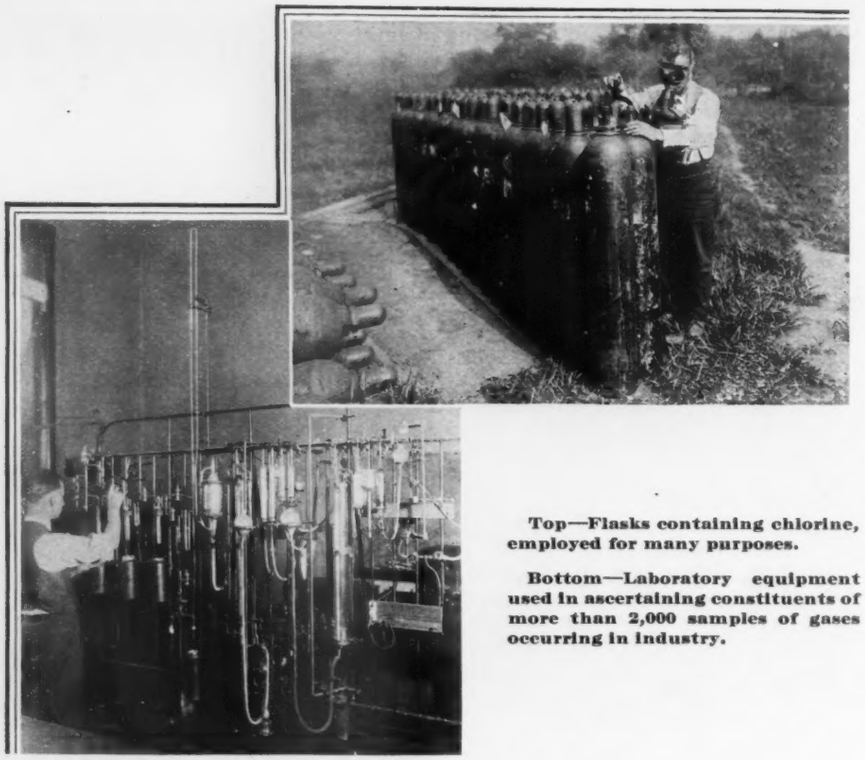
Mechanical means of this sort should be provided to detect and combat all gases that do not make their presence known in time to prevent trouble, and that is the aim of the work now in hand. Carbon dioxide, for example, is both colorless and odorless. It is needed in making soda water and other carbonated beverages, and for service in refrigerating units. An atmosphere of carbon dioxide will not support life. Nitrogen, used in the manufacture of ammonia and nitric acid is colorless and odorless, as well as tasteless.

There is, however, a long list of harmful gases that do give off characteristic odors which make it easier to deal with them. Wherever these are utilized it is now the practice to teach the men exposed to them proper methods of detection. Acetylene, for instance, smells like garlic. Ammonia, so extensively used as a refrigerating agent, has a pungent smell but no color. Chlorine is a greenish-yellow gas with a very disagreeable odor. It is about two and a half times as heavy as air and very suffocating and irritating. Chlorine is utilized in the textile and paper industries for bleaching, in the production of synthetic dyes, in chemical and explosives industries, and for sanitary purposes.

Then there is ethylene, a colorless, combustible gas with an unpleasant odor. It is one of the constituents of illuminating gas and has proved useful as an anaesthetic. Ethylene is also widely employed in the synthetic chemical industry and for coloring unripe fruit. Ethyl chloride is a gas with a pungent smell not unlike that of ether. It serves both as a local anaesthetic and as a refrigerant.

The list, as will be observed, is a rather lengthy one, and includes hydrogen cyanide, an insecticide and fumigant, that has a taste of bitter almonds. Nitrous oxide is a combination of nitrogen and oxygen. Under ordinary temperature and pressure it has a faint, agreeable odor, and is sweet to the taste. When inhaled it causes a person to become unconscious and insensible to pain and therefore finds use as an anaesthetic for minor operations. It is commonly called "laughing gas".

Men and animals are being exposed to these different gases to learn their physiological effects. The studies include many problems,



Top—Flasks containing chlorine, employed for many purposes.

Bottom—Laboratory equipment used in ascertaining constituents of more than 2,000 samples of gases occurring in industry.

such as the tendency of nitroglycerine and ethylene glycol-dinitrate to cause distressing headaches in the ordinary course of handling these explosives, and the effect on the human body of the absorption of the liquids through the skin and of the vapors through the lungs. The effect of the gases on blood pressure and the lethal doses are determined by the use of animals.

The dangers that lurk in vapors of benzol, acetone, and gasoline, and the odor intensity and the physiological response to various concentrations in the air of vapors of propane, butane, pentane, hexane, and heptane are under scrutiny. The latter are natural-gas products, and are burned as fuel in rural districts and in industry. These gases are distributed in cylinders, under pressure. In the case of certain gases, frontal headaches are often induced when the saturation reaches 18 to 20 per cent, and occipital headaches, accompanied by vertigo, when it amounts to 23 to 28 per cent. Absorption of gases is more rapid in men at work than in men at rest.

To enumerate all that is being done in this direction to safeguard the workers would be wearisome; but this article would not be complete without some mention of the field of fumigation. Every ship arriving at a United States quarantine station from a foreign country is required to show a certificate of fumigation of recent date. If not forthcoming, the vessel is turned over to the Public Health authorities for fumigation. Hydrocyanic acid, a penetrating and extremely toxic gas, is widely used in this work; but, because of its poisonous character and its lack of warning properties, it is a constant source of danger to human beings and animals. Fatalities have occurred again and again either during the process of fumigation or immediately afterwards. It has been found that ventilation, subsequently, will not completely remove from refrigerating rooms, for example, all dangerous traces of hydrocyanic acid. Casualties have occurred by leakage of the gas through cracks into adjoining compartments. Now a method has been developed whereby cyanogen chloride, a tear gas, is liberated along with the hydrocyanic acid, thus giving instant warning of the presence of the harmful gas.

LENGTHENING THE LIFE OF PAPER MONEY

MONEY that will last longer in circulation, if not in the pocket, is a promise held out to us and all because M. U. Schoop, of Zuerich, has succeeded in making paper well-nigh indestructible by coating it with metal. Heretofore, all efforts to accomplish this have failed because the cellular structure of the fiber was injured, weakened, by the processes. This shortcoming has apparently been surmounted, if reports from Switzerland be true, as the result of a modification of the familiar Schoop method of spraying molten metal.

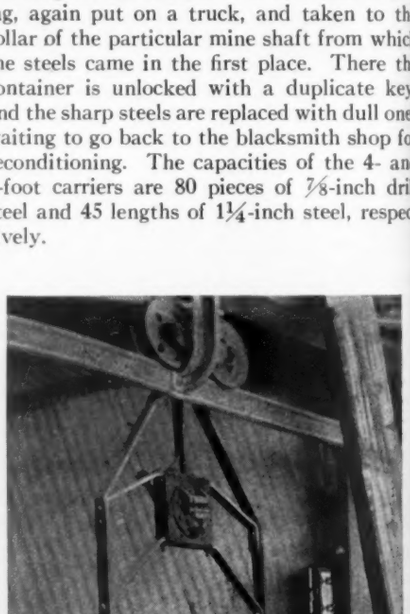
By means of a special form of the Schoop spray pistol, sheets of paper have been given a protective coating of tin, copper, or aluminum. The product is said to be very flexible and to lend itself readily to the purpose for which it was primarily designed—that is, for the making of bank notes that will stand up indefinitely under the wear and tear of handling. However. in other quarters, interest is shown in the possible application of plates of this description to the fields of radio and telephony.

OLD PIPE MAKES SATISFACTORY DRILL-STEEL CARRIERS

TO expedite the transportation of drill steels to and from their extensive underground workings in the Pachuca district, in Mexico, the Real del Monte Company has provided a type of carrier of its own design that is especially well suited for the work. As the accompanying illustration shows, the carrier is all enclosed and therefore protects the sharpened steels from damage while in transit over a 6-mile aerial tramway. This tramway connects the company's surface plant at the Loreto mill with the Arevalo group of mines, and is used to transport ore and supplies.

The carriers are made of old wrought-iron pipe $\frac{3}{16}$ inch thick, 12 inches in diameter, and either 4 or 7 feet long so as to accommodate different lengths of drill steel. They have hinged doors at both ends, enabling them to be loaded or unloaded from whatever end happens to be most convenient; lugs that engage the ore-bucket stirrups; and stands to prevent them from rolling when they are not in suspension.

After a carrier is filled with sharp steels at the Loreto mill, its doors are locked and, together with two others, is hauled to the aerial-tramway terminal by a narrow-gage truck. This truck is at just the right elevation to permit inserting the stirrups into the lugs without the need of lifting the carrier. Upon reaching its destination it is run onto a siding, again put on a truck, and taken to the collar of the particular mine shaft from which the steels came in the first place. There the container is unlocked with a duplicate key, and the sharp steels are replaced with dull ones waiting to go back to the blacksmith shop for reconditioning. The capacities of the 4- and 7-foot carriers are 80 pieces of $\frac{7}{8}$-inch drill steel and 45 lengths of $1\frac{1}{4}$-inch steel, respectively.

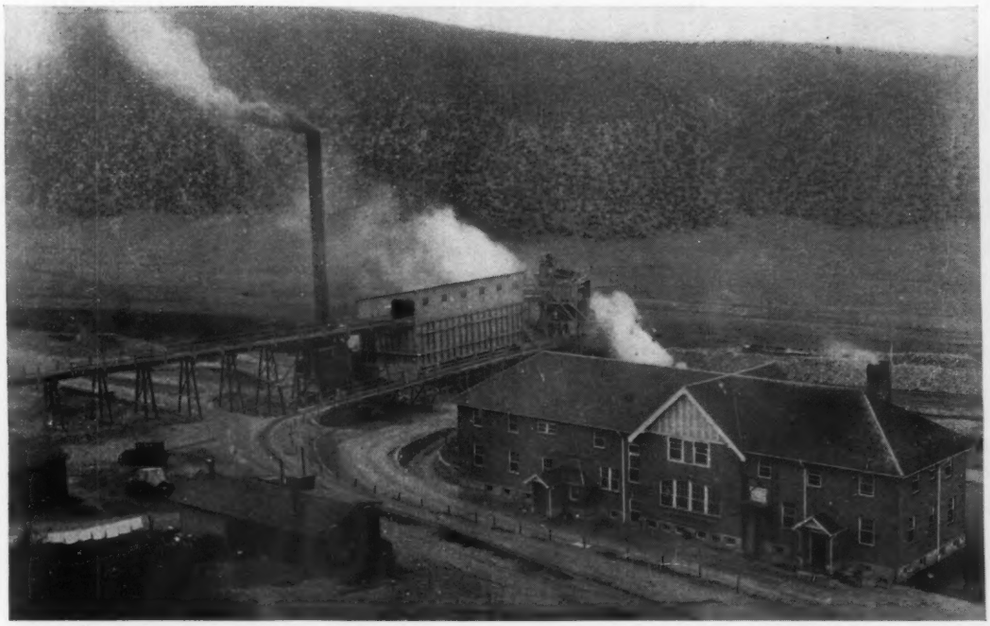


Engineering & Mining Journal

One of the 4-foot carriers in transit. It has a capacity of 80 lengths of ⅞-inch drill steel.

Mining Limestone for Use in the Making Of Beet Sugar

By C. H. VIVIAN



General view of the Horse Creek, Wyo., property. The screening plant and power house are in the background.

THE Great Western Sugar Company uses more than 250,000 tons of limestone annually in the production of beet sugar. To secure this rock it works a number of deposits in Colorado, Wyoming, and Montana. The largest of these operations, at Horse Creek, Wyo., approximately 30 miles west of Cheyenne, produces about 10,000 tons a month.

The average reader will ask: "What has limestone to do with the manufacture of sugar?" Without going deeply into the details, we may briefly answer the question at the outset by sketching what happens to sugar beets after they are dug from the ground, topped, delivered at the factory, and washed.

They are mechanically cut into thin shreds or cossettes. These are immersed in warm water in vertical cylindrical vessels known as diffusers. From ten to fourteen diffusers form a battery. By circulating water through a battery for a period of approximately two hours, upward of 99 per cent of the suchrose content of the beets is extracted.

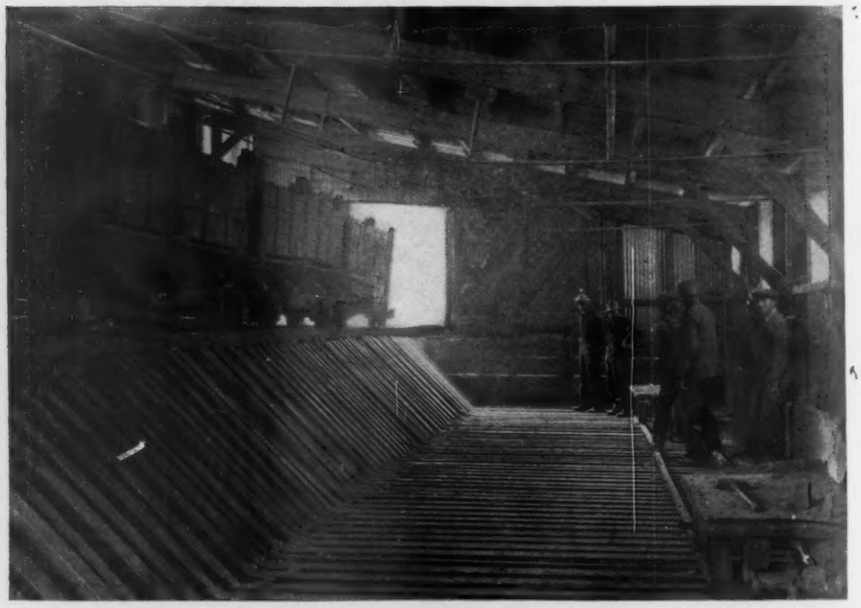
The product of this diffusion process is a juice of light gray color which contains from 10 to 13 per cent sugar. It also contains some particles of beet pulp in suspension; solutions of various albuminous substances; nitrogenous matter; organic and inorganic acids of several kinds; salts of potassium, sodium, calcium, and magnesium; chlorine, etc. These are all classed as impurities and must be removed.

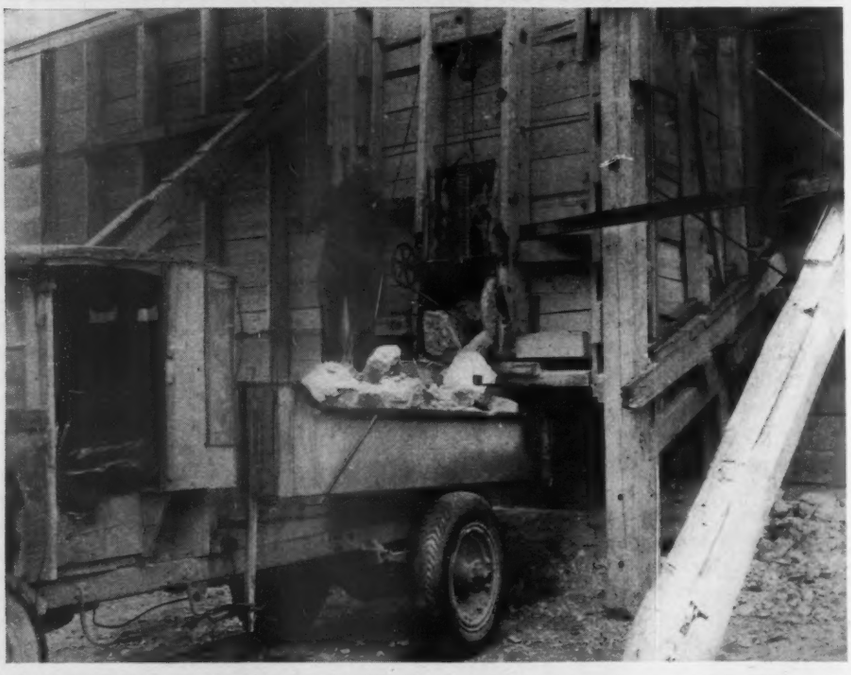
The beet pulp is taken out by screening. The other foreign substances are eliminated by treatment of the juice with lime. This is done in two ways, which vary according to the plant process employed. In what is known as the non-Steffen's house separation, calcium hydroxide, or milk of lime, is added to the heated diffusion juice in amounts of 1.5 to 3 per cent by volume. At the same time the lime is added, carbon-dioxide gas is introduced at the bottom of the liquid and allowed to bubble up through it. The resulting action is both mechanical and chemical in nature. The lime envelops organic particles suspended in the juice and carries them downward. It also combines chemically with all the free acids and forms insoluble salts. The rising carbon dioxide meets the lime, forms calcium carbonate, and sinks to the bottom as a precipitate which carries with it the impurities. The precipitate is removed in filter presses. This leaves a clear juice from which the sugar is crystallized out by evaporation under a partial vacuum.

A partly filled stope that has been mined to the surface, showing a small amount of limestone left in place to support the side walls.

In the Steffen's house process, a cold, dilute sugar solution is treated with powdered quicklime, or calcium oxide. For this purpose the lime must be ground fine enough to pass a 200-mesh screen. The lime goes into solution, forming, with the sugar, after intermediate reactions, a calcium trisaccharate, which precipitates out. The waste water that remains contains substantially less than 1 per cent sugar. By subsequent refining processes the sugar is extracted from the calcium trisaccharate.

In the early stages of the beet-sugar industry in Colorado, several independent factories were started. They obtained their limestone from Missouri. Then it was discovered by one of the companies operating in northern Colorado that a supply of suitable lime rock was available close at hand, and a quarry was opened at Ingleside, northwest of the City of Fort Collins. The other factories followed this lead and began taking out stone in the same area. To eliminate duplication of efforts, they soon organized the Ingleside Limestone Company to produce sufficient rock for their combined needs. About this time the several factories were brought together to form the Great Western





Top—Grizzly which receives all the rock as it comes from the mine. Bottom—Loading waste rock that has been rejected at the grizzly because of its inferior quality.

Sugar Company. This organization has now grown into the greatest beet-sugar producer in the United States, with 21 factories in Colorado, Wyoming, Montana, and Nebraska. The Ingleside Limestone Company still functions to supply all these plants. It is now a subsidiary of the parent company.

Pure limestone is calcium carbonate. To make it ready for use at the sugar factories it is burned with coke in 135-ton Belgian type kilns, forming calcium oxide and carbon dioxide, both of which are employed as previously outlined. Rock of a high degree of purity is desirable; and the company sets 96 per cent calcium-carbonate content as the lowest grade that is acceptable. As a matter of fact, most of the stone used runs 97 per cent or better. One deposit is of 99 per cent purity; but the rock is so hard that it presents problems in burning which have not been entirely solved. It is also so friable that it cannot be effectively mined by the room-and-pillar method, which is the most feasible system at that particular property. There are, then, other things than purity that must be taken into consideration when selecting a stone for sugar-factory use.

The Horse Creek property supplies limestone to ten factories in Colorado, two in Nebraska, and one in Wyoming. Unlike the other operations of the company, it is worked as an underground mine instead of as a quarry. It was first operated as an open pit in 1912, but this method was soon abandoned. Some tunneling was done from 1920 on, but the present large-scale operations date from about 1924.

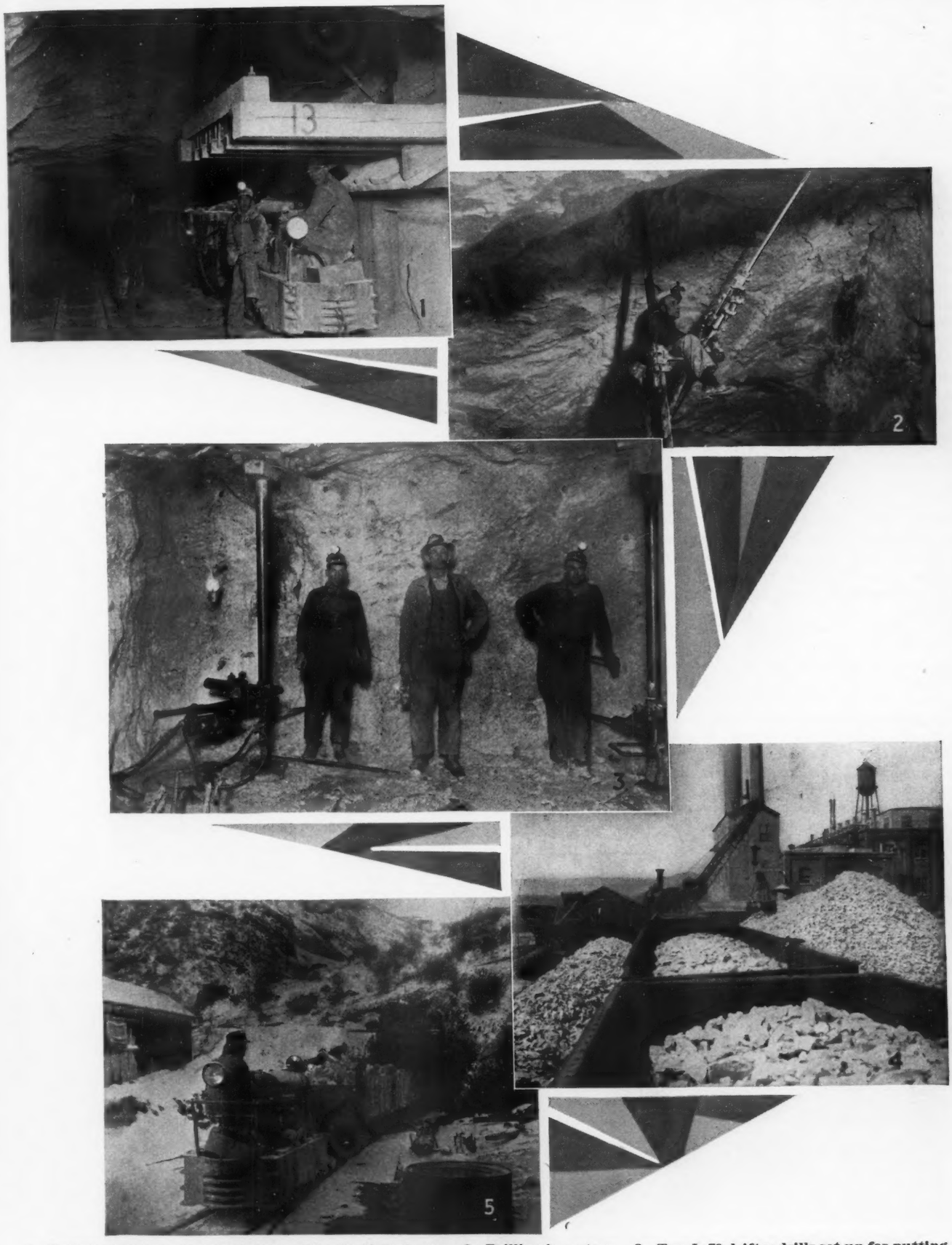
The limestone reaches the surface in almost perpendicular strata which, with associated rocks, form a typical "hogback" that has a north and south axis and rises well above the adjoining ground on the east and west. The formation is classed geologically as Madison lime, which produces oil in some sections of Wyoming.

To cut the limestone underground, an 8x9-foot adit was driven horizontally into the eastern base of the ridge at right angles to its axis. Two bands of lime rock are being worked. The first of these, No. 5, is 33 feet thick, and is cut at a point 900 feet in from the portal. The second, known as No. 3, is 200 feet farther in and is from 20 to 23 feet thick. Drifts 14 feet wide and 8 feet high have been driven north and south on both bands for a distance of 1,300 feet each way from the adit, opening each stratum for a horizontal distance of 2,600 feet.

These drifts are on the hanging-wall sides of the strata. At intervals of 35 feet, 6x8-foot raises are driven into the limestone on the footwall side of the drifts at an angle of approximately 30 degrees from the horizontal. Chutes are placed in these raises for loading rock. At the time the mine was visited, 110 of these chutes had been installed. From these raises the rock is stoped clear across the veins. The amount of stoping ground between the drifts and the surface varies from a maximum of 350 feet south of the adit to as much as 600 feet north of the adit. The existence of hanging walls of solid quartzite 12 feet thick makes timbering unnecessary; and practically the entire overhead deposit of stone can eventually be taken out.

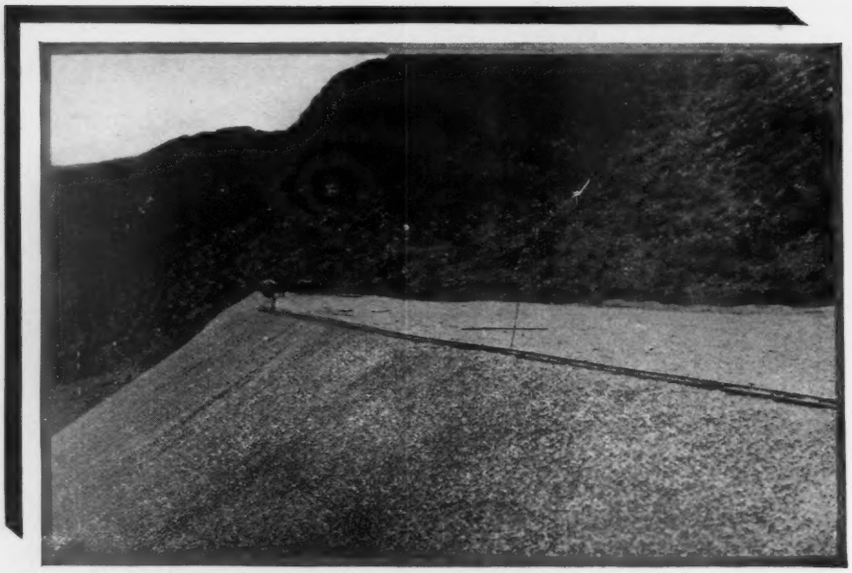
The filled-stope or shrinkage method of mining is employed. The rock is shot down from overhead. When the stope is filled so that there is no room for the men to work on top of the pile, sufficient stone is drawn off through the chutes below to permit setting up drills for further drilling. In effect, there are two large stopes, one on each band of rock and 2,600 feet long. Stoping is carried progressively upward by benches from each end toward the center. The result is to produce in each stope an immense pile of broken rock that reaches its greatest height above the adit in the center and slopes toward both ends. It is estimated that there is now in these stopes from 400,000 to 500,000 tons of broken rock. This can be drawn upon through any of the 110 chutes. As operations proceed, the drifts are being extended farther into the lime rock on both the north and the south and new raises are being driven, thereby continually increasing the length of the stopes.

The chutes project out into the drifts directly over 24-inch-gage tracks. This permits loading stone into cars by gravity. This circumstance, together with the fact that



1—Trainload of limestone under one of the loading chutes. 2—Drilling in a stope. 3—Two L-70 drifter drills set up for putting in a round of holes at the breast of one of the drifts. Superintendent Fred Harrison is in the center of the group. 4—Limestone yard at the Loveland, Colo., factory of the Great Western Sugar Company. 5—Train of limestone coming out of the adit.

there is no need for timbering, makes the underground method of mining economical. There is also the added advantage of being able to carry on work throughout the year, which is impossible or, at the best, very undesirable in the case of open-pit operations because of the severe weather conditions that prevail during the winter months.



Part of the huge dump of waste rock that is too small for sugar-factory use.

Each drift has two tracks, one for loaded cars and one for empties. The rock is loaded into side-dump cars, each of 3 tons capacity. Trains of from four to six cars are horse drawn for spotting under chutes. When loaded, they are hauled out by locomotives consisting of converted Fordson tractors. At several points the stopes have been opened to the air above, and natural ventilation is so strong that carbon-monoxide gas from the locomotive exhausts is unnoticeable. Bulkheads have been installed to cut down the draft in cold weather so as to make for more comfortable working conditions. A negligible amount of water is encountered in the workings, and no pumping is required.

In the stopes, a drilling round is made up of from twelve to sixteen holes, each 18 to 20 feet deep. Most of this drilling is done with "Jackhamer" drills mounted on columns. These holes are shot with a special dynamite and bring down as much as 150 tons of rock to the round. At the drift headings, 32 holes, placed sixteen on either side of the face, constitute a round. The cut holes are 9 feet deep, the rib holes 8 feet. These are drilled with an L-70 drifter mounted on a vertical column. One man puts in a round of holes in two days. Blasting at the headings is done with 40 and 60 per cent gelatine dynamite.

A 4-inch compressed-air line runs into the mine from an outside power house, where two compressors are installed. They are steam-driven Type XPV machines which have been in service for several years. Both are of 14-inch stroke. Air is delivered to the drills at about 90 pounds pressure.

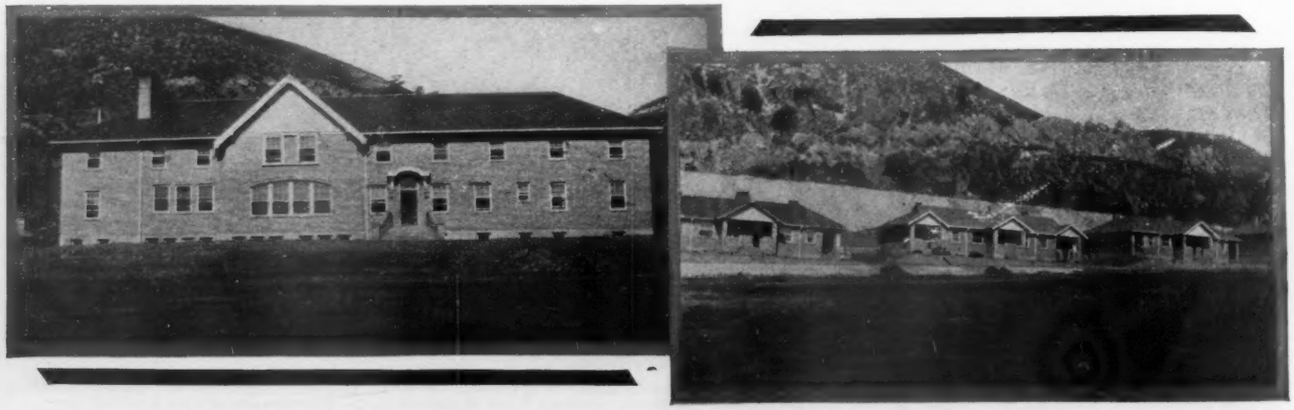
Because the rock must be within certain size limits for best results in burning, an extensive plant for its sizing has been installed in connection with the mine. Trainloads of rock are dumped on to a grizzly, 15x72 feet, made by spacing inverted 85-pound rails 5 inches apart. A crew of men with sledges break the oversize pieces so that they will pass through. They also pick out any waste rock that comes under their eyes.

From the grizzly the rock falls into bins of 500 tons capacity. From these it is fed on to a conveyor belt which delivers it to a revolving screen 24 feet long and 52 inches in diameter. The first half of this screen allows stone smaller than 2 inches to pass through. It falls on to a belt which conveys it to a bucket elevator which delivers it to a screen at the top of a bin. The real fine material passes through this screen into the bin and is transported in cars to a dump which now contains thousands of tons of it. Rock which will not pass the screen is suitable for concrete aggregate and railroad-track ballast, and is sold for these purposes. Approximately one-third of the stone mined is below 2 inches in size and is therefore waste material so far as its use at the sugar factories is concerned.

Getting back to the revolving screen, material above 2 inches and below 4½ inches falls through the second half and on to a broad conveyor belt known as a pick belt. A man stationed there picks out inferior stone and drops it on another conveyor belt. The good rock is loaded into cars for shipment to the sugar factories. Rock so large that it passes over the end of the screen falls on to another belt which carries it into cars. Two pickers eliminate inferior rock from this belt, disposing of it in the manner previously mentioned. The conveyor belt carrying waste rock feeds on to another one that runs beneath the grizzly. All picked rock is thus eventually brought together; elevated to a bin; loaded into wagons; and hauled away.

When working at capacity, the Horse Creek Mine employs 65 men. To comfortably house them, a 24-room modern hotel with all conveniences has been constructed. The company has recently completed six brick structures which provide a total of 21 modern apartments for married men and their families. The premises have been landscaped and lawns planted. These efforts at providing comfortable living quarters for employees have done much to cut down the labor turnover, despite the fact that the mine is in an isolated section.

The Horse Creek Mine has been developed under the direction of W. M. Rex, general manager of the Ingleside Limestone Company. It was he who evolved the plan for underground mining and who placed it on a sound, economical basis. Fred Harrison is superintendent in direct charge of operations.



Left—This modern hotel provides comfortable accommodations for the unmarried workmen. Right—There are six of these attractive homes on the property that house a total of 21 families.

The portable and one of the paving breakers that helped to rebuild a busy highway in just half the time it would have taken had the work been continued as begun with hand labor.

Compressor Plant Expedites Road Job

By A. R. CRAFT

AN interesting example of what can be done with modern compressed-air equipment—that is, the remarkable gain that can be effected by substituting it for hand labor on road work, is provided by a recent reconstruction job carried out by the District Council of Burnley, Lancashire, England. The road under consideration leads to several cotton mills, and is used by a considerable and growing volume of heavy traffic including passenger buses on scheduled runs.

Briefly, the contract involved the removal of the existing macadam roadway and the building of a new and wider one, of concrete, complete with curbing, flagging, and drainage facilities. As the macadam had become very tightly compacted by years of heavy traffic and the annual use of bituminous surface dressings, the task of ripping it up proved to be beyond the powers of the council's steam-roller-drawn scarifiers.

For a time, men with picks and shovels were employed to do the excavating, which had to be carried to depths varying from 6 inches to nearly 2 feet. While they did their work as well as could be expected under the circumstances, they were unable to keep the haulers of the spoils busy; and lack of space prevented putting enough of them on the job to make satisfactory progress. Interference with motor traffic to the mills and inconvenience to the bus-traveling public were serious matters, both from the point of view of expense and delay, and the adoption of more expeditious methods became imperative.

The local authorities—a rural district council—did not have available the type of compressed-air plant that has been found such a boon in recent years in all big cities and that Mr. F. Hewitt, F. S. I., the council's engineer, had used during his previous appointment elsewhere to great advantage. Fortunately, it was possible to make arrangements for the loan of this plant, which consisted of an Ingersoll-Rand 5x5-inch, gasoline-engine-driven, portable compressor and paving breakers. The same day the negotiations were completed the equipment was brought to Burnley by roadway a distance of 80 miles.

The moment the compressor and the paving breakers appeared on the scene a marked change took place. The compacted and concrete-like crust yielded easily, even in the deepest sections, to the air-driven tools, and it was soon apparent that the only check to progress was that imposed by the haulage contractor—the loading and removal of the broken-up material was not keeping pace with the excavating. Extra wagons were therefore put on to speed up this phase of the operations, with the result that all fears were dispelled that the time limit, against which the council was working, would be exceeded.

In half the time it would have taken to do the excavating by hand methods the macadam was broken up and hauled away and the roadbed prepared to receive its foundation. The very obvious gain in time effected by the pneumatic equipment brought much praise from the local taxpayers and mill owners, while the bus service was returned to normal far more quickly than would otherwise have been the case. The use of a quick-setting cement for the concrete was another contributing factor—helping by just that much to restore the road to traffic in record time.

The road was paved in half widths so as to reduce traffic interference to a minimum—crossovers being provided at suitable places to keep vehicles off newly laid concrete. To avoid blocking intersecting streets for days running, the concrete laid at those points was made of a high-alumina cement. It was thus possible to limit the hold-up period in each case to 24 hours. Throughout those sections of the road having a gradient of 1 in

A finished section of the concrete road that is being rough-surfaced on grades.

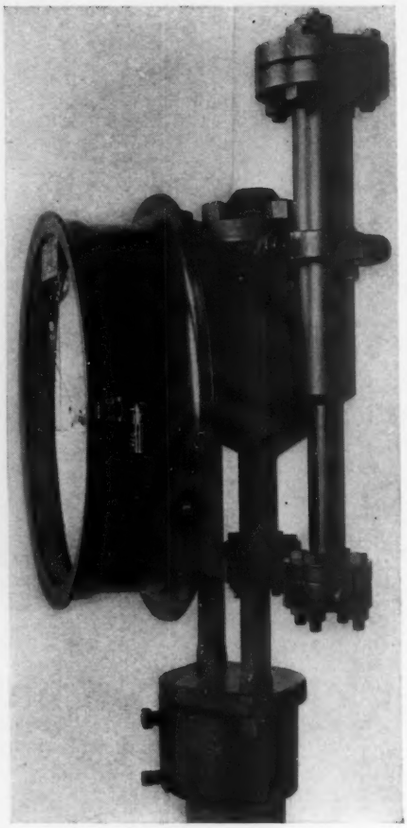
10, the concrete was rough-surfaced in order to give draft animals a good foothold in ascending and descending.

The foregoing facts give a good idea of the time that can be saved with pneumatic equipment on work of this kind; but, partly because the job in question was done with a borrowed compressor and tools, the equally important item of costs is not available. However, the council owning the portable has carefully kept cost figures from the day it was purchased in 1924. Since that date, additional paving breakers, trench diggers, drills, etc., have been obtained, and these, together with the original equipment, have involved an expenditure of $3,008.08 at the current rate of exchange. From 1924 to 1928 a sum of $1,651.59 was spent for gasoline, oil, renewals, etc., making a total cost for that period of $4,659.67.

During those years the compressed-air plant was used on different undertakings; and it was estimated that the average operating cost was $5.29 per working day. This takes into account gasoline and oil, and allows for depreciation at the rate of 22½ per cent. A flat charge of 25 shillings or $6.08 per day was made for the loan of the equipment to other departments or when it was called upon to operate on jobs done with the assistance of the Ministry of Transport or other government bureaus. The figures given, of course, do not include wages.

Summing up the work of this particular portable outfit, it was found that the aggregate earnings for the four years came to $4,641.89. It will be seen, therefore, that, with the exception of the trifling sum of $17.78, the unit had paid for itself by March 31, 1928. At that time the compressor was virtually as good as new and had many years of useful life ahead of it, years during which it worked at a clear profit.

The 4-mile lagoon separating Venice from the mainland of Italy is to be spanned by a highway bridge.



One of the new Foxboro recording flow meters designed for high-pressure service.

NEW FLOW INSTRUMENTS FOR HIGH-PRESSURE WORK

THE Foxboro Company of Foxboro, Mass., has brought out new high-pressure recording flow meters and flow controllers built for operating pressures of 2,500 pounds per square inch. These supplement the instruments put out by the company for pressures of 5,000 pounds. Our picture is of a single-pen 2,000-pound recording flow meter. For static readings, a 2-pen instrument with static element is furnished: for total flow readings an integrator can be supplied that gives the readings without the use of multipliers.

The new meters and controllers retain all the desirable features of the earlier instruments; and because of the field experience with the latter, the 2,500-pound recording flow meters are said to have no errors or variables, no unknown quantities, no inherent defects. Summing up the virtues of his latest product, the manufacturer says: The combination of the following factors—accurate coefficients, a differential measuring device that is inherently correct, a simple integrator that can be depended upon, positive control action, and chambers that will withstand high pressures—results in high-pressure flow meters and flow controllers that are rugged and accurate. They can be mounted without the use of loading devices, making them particularly suitable for modern field service.

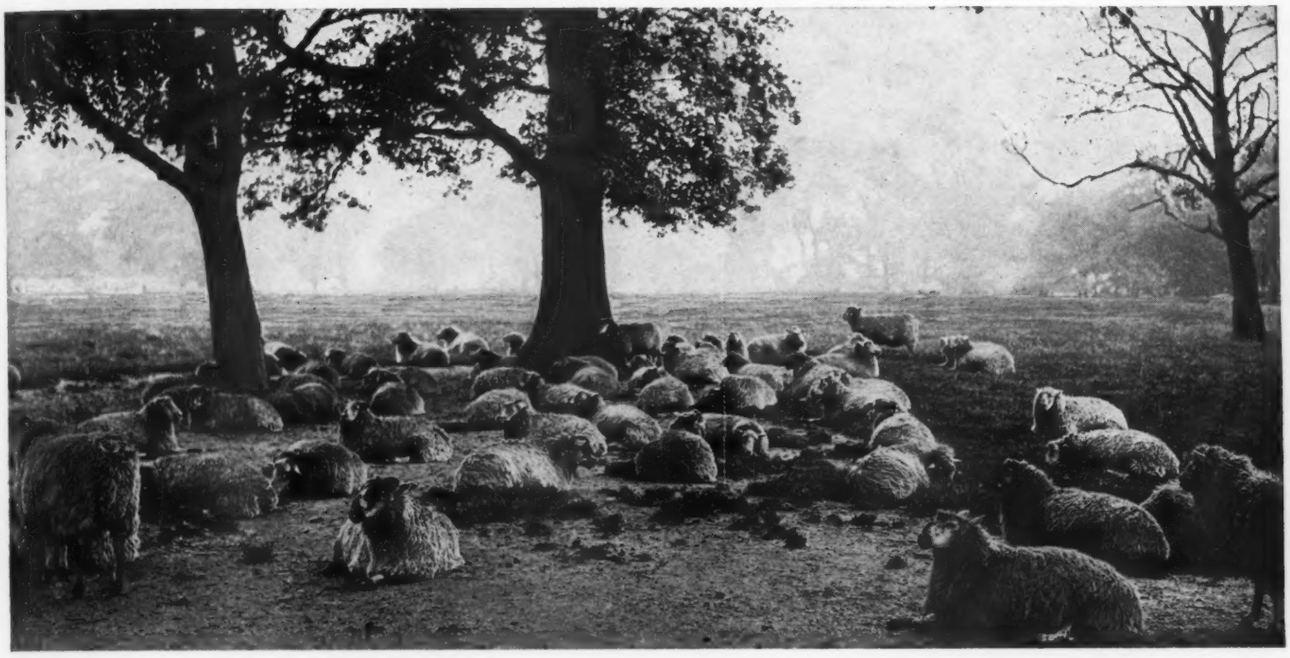
SELF-LUBRICATING BEARING METAL

BEARING metals that are said to be ten times as efficient as the so-called oil-less bearings in use today have been invented by W. C. Wilharm of the Westinghouse Research Laboratories. The new bearings are the outcome of exhaustive tests, and are made by mixing one or more metallic powders with one or more materials yielding a soapy substance. The ingredients are put in a cold mold and subjected to a pressure of approximately 40,000 pounds per square inch. The temperature is then gradually raised until it reaches about 400° F. After the mold has been kept at this temperature for half an hour the pressure is raised to 200,000 pounds per square inch. Following that the pressure is released and the mold allowed to cool before the bearing is removed. Bearings can thus be molded to meet certain specifications or they can be made in blank and machined to size.

Ewing Galloway, New York

Brooklyn Bridge and lower New York's skyline viewed after nightfall from the East River.

Weaving Felts for Paper-Making Machines



By R. C. SKERRETT

SHEEP and newsprint! Surely, they have nothing in common? Quite to the contrary—they have.

For the sake of the inquiring, be it known that the fleece of browsing sheep is indispensable not only in the making of familiar newsprint but in the production of substantially all sorts of papers, be they thick or thin, coarse or fine.

But for the wool of sheep, the papermaker would be hard put to it to find some other filament that could be worked satisfactorily into those belts and jackets—broadly called "felts"—that are universally employed as integral parts of modern paper-making machines. The reason for this can be readily comprehended if we outline briefly a single phase of the manufacture of one kind of paper—newsprint, for instance.

Probably no step in the process of turning out newsprint is more amazing to the uninitiated than the transformation that takes place between the time the "stock" leaves the flow box—looking for all the world like a thin gruel well-nigh devoid of consistency—and its issuance from the calender rolls less than a minute later as a sturdy and glistening sheet of paper! The change wrought in the stock in that brief span is very largely due to the effective action of felts that are interposed between the moving screen at the wet end of the machine, on which the pulp first falls, and the drier and calender rolls from which the paper is shot forth in its finished state.

The felts, in combination with heavy pressure from wringer rolls, extract from the watery pulp all but a very modest percentage of the originally contained moisture, and thus, progressively, nurse the paper stock along and finally help to give it its ultimate designed texture and structural stability. Because of the inherent absorptive capacity of the woolen felts, moisture is withdrawn, step by step, from the pulp as the jackets or belts press or transport the evolving paper on its journey through the succession of rolls. This treatment continues from end to end of the machine until the paper has reached a stage of physical maturity that makes it fit to be passed through the drier and calender rolls for final finishing.

To the casual observer, the services performed by the felts might appear to be decidedly simple ones, but smooth as their actions are, still their effectiveness is the outgrowth of many years of experience and the exercise of much technical skill and expert control during every stage of manufacture. Indeed, the very term "felt" is a misnomer and misleading: it is reminiscent of the early days of mechanical paper-making. Then, felted woolen material—not unlike the pressed felts used in the production of hats—served the needs of papermakers. Later on, however, the industry discovered that woven woolen fabrics were far superior and much better able to meet the ever-increasing demand for greater speed in turning out paper. Now let us see how truly manysided is the present-day art of making felts not alone for the paper industry but for numerous other lines of manufacture. Our story has to do with activities at the plant of the Albany Felt Company, Albany, N. Y. The company has been engaged in this highly specialized and exacting business for a period of 30 years.

In the wool-sorting room.

To make our recital understandable to the layman, we shall start at the very beginning of the subject—that is, with the basic wool that is eventually woven into felts that will answer not only the needs of the paper mill to be served but even those of the particular machine for which the felts are ordered. Strange as it may seem, two supposedly identical machines will often differ in many respects in their felt requirements; and the wools and yarns used and the weave adopted must be chosen accordingly.

If one will take the trouble to consult an encyclopedia, it will quickly become evident that the breeding and the crossbreeding of sheep have led to the evolution of wools of many and diversified characteristics. Furthermore, to add to the complexity of the matter, the wool of a single sheep will vary in length, fineness, and other qualities in different parts of the fleece. The wools used by the Albany Felt Company are drawn virtually from all parts of the world; and both breeding and climate have a direct bearing upon the physical properties of the fleece.

For general use, it may be necessary to proportion and to mix as many as eight varieties of wool in order to obtain a blend that will satisfy specifications, while for special services a still larger number of varieties may be commingled in preparation for the weaving of suitable felts. The determination of acceptable varieties rests with the felt-designing engineer; and responsibility for the selection of the different wools is placed upon the shoulders of an expert of long experience—a man that knows wool intimately. Let it be stated here that there are hundreds of different styles of felts—each having proved best in meeting the speed of a machine, the kind of stock used by the papermaker, the weight of the product, and the nature of the finish desired.

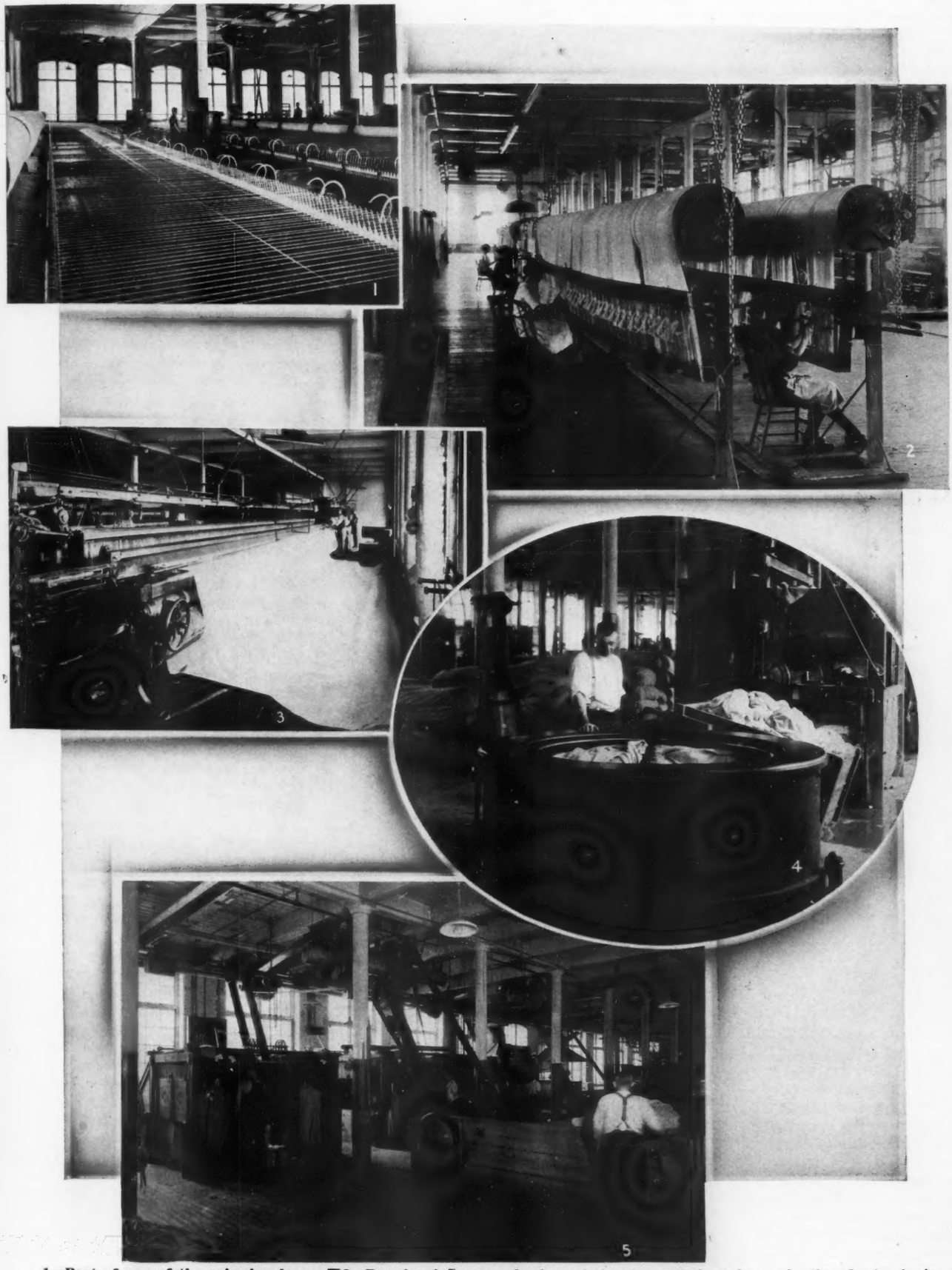
The primary selection and the proportions of the different wools to be used in fabricating a given felt or jacket are the consequence of operating experience plus painstaking work in the research laboratory of the Albany plant. In that laboratory there are facilities for making all essential tests not only of the raw wools but of the yarns and woven felts produced from them. Assuming the choice of wools to be correct for a certain felt, then equal care must be exercised in prescribing the type of yarns that will be made from the raw material and then woven to form the warp and the filling of the finished product. In addition to that, the weave, itself, must be such that it will absorb definite amounts of moisture at different stages in the process of paper-making. This work must be done so as not to impair the finish of the paper by leaving on it undesirable marks. Some yarns must be of a heavy, coarse nature to give strength, while other yarns must be spun to an exceptional fineness if they are to aid in producing high-grade papers. Even a difference in the twist of a yarn may have a pronounced effect upon the operating life and effectiveness of a felt. So much for some of the considerations that the feltmaker must keep continually before him.

All in all, there are 22 distinct operations in the manufacture of a felt; and precise formulae must be followed in producing a satisfactory commodity. We need not familiarize ourselves with the entire score inasmuch as the purpose of this article will be served if we mention only the more outstanding stages of manufacture. With wools arriving from New Zealand, Australia, the British Isles, South Africa, South America, Canada, and various parts of our own country, it is needful that the incoming fleeces be carefully and skillfully sorted by trained men. The sorters lop off certain parts of each fleece that experience has proved to be unfitted for felt-making, and the remaining sections are separated, graded, and piled, respectively, into just so many large hampers. A boss sorter, whose decision is final, inspects and passes upon the work of his subordinates.

1—Wool undergoing successive stages of scouring. 2—In the carding room where the wool receives an essential preparatory treatment. 3—In this department the yarn is rewound to make it ready for weaving.

after which the fleece-laden baskets are emptied through openings in the floor into underlying bins agreeably to their gradings. There the material remains until withdrawn for manufacture.

When the man in charge of the scouring room of the plant is notified that so much wool of so many different grades is required for the making of a specified felt he withdraws the designated quantities of raw wool from the respective bins. This wool is run through a duster, where it is freed of any dirt that may be clinging to it—a suction fan completing the treatment. The dusted wool is picked up and carried by power-driven conveyors to a battery of washing or scouring machines. All told, there are four of these in service. The scouring process entails the use of chemical solutions and zero-

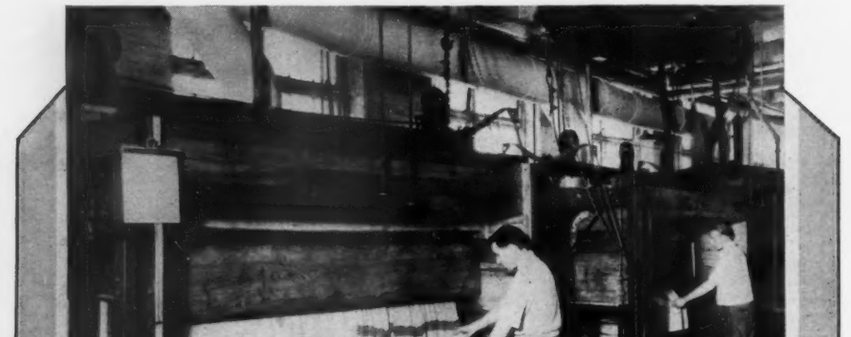


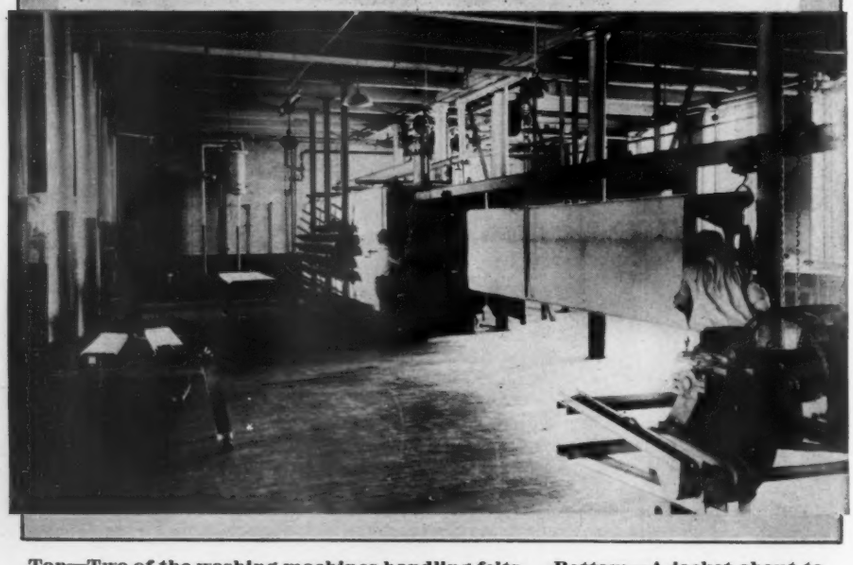
1—Part of one of the spinning looms. 2—Drawing-in room. 3—One of the three 488-inch looms in the plant. 4—A hydro-centrifugal extractor in the wet-finishing department. 5—A corner of the fulling room.

soft water. The strengths of the chemical solutions and the temperatures of the several baths are prescribed to a nicety lest the fibers of the wool be injured. The whole procedure is under perfect control; and air-operated automatic thermostatic apparatus regulate the heat range. The wool passes successively through the scouring machines, during which the fleece is combed by a multiplicity of brass fingers. After each stage of the scouring the wool is wrung by rolls and dropped into an associate bowl. From the last bowl the wool falls into a hopper, whence it is swept by a blast of air to a drier and deposited upon a slow-moving wire apron.

The drier is divided into seven separate compartments, each having a definite temperature range that is maintained by air-operated thermostatic apparatus. The highest temperature is in the entrance division—the heat being gradually diminished until it is about room temperature at the exit end of the drier. By applying the highest temperature at the start quick evaporation is induced; and evaporation thereafter tends to cool the wool and to safeguard it from harmful overheating. The procedure employed makes it possible to dry the wool in a few minutes instead of in a much longer interval, as was formerly the case when the system was not as modern as it is today. The raw wool enters the drier holding nearly its own weight in moisture; and it issues from the drier with only a small percentage of moisture.

Fleecy and clean, the dry wool is blown through metal ducts to bins in the blending room—each grade of wool being handled separately while undergoing scouring and drying. The man in charge of the blending room then takes from each bin the specified amount of the several grades of wool and makes as many piles on the floor as there are different grades. The amount of each is determined to a nicety by weighing. The final operation is to commingle the grades so that the entire quantity shall be as uniformly mixed as it is humanly possible to do so. Much depends upon the work of the blender, because the strength, the uniformity, and other characteristics of the ultimate fabric are the outcome of the care exercised in making the blend.



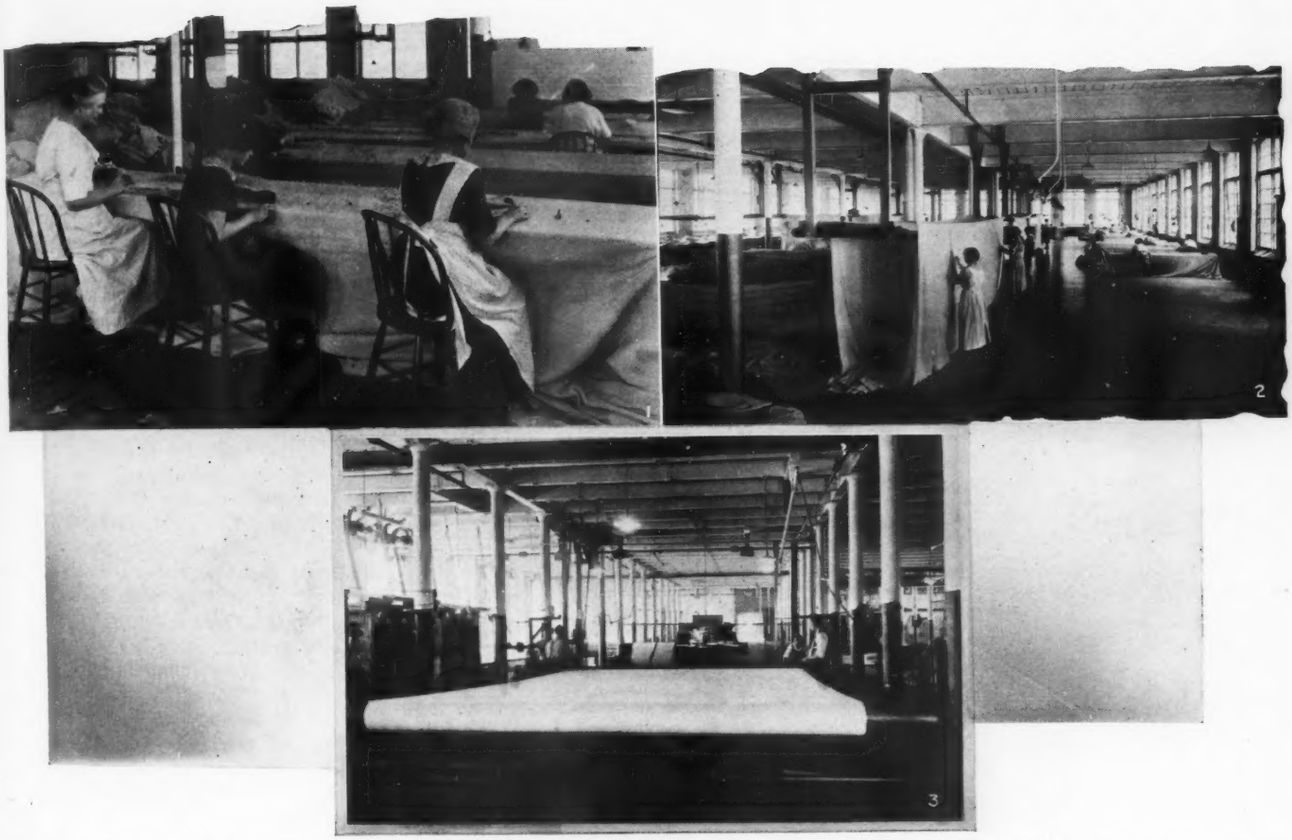


Top—Two of the washing machines handling felts. Bottom—A jacket about to be run into the vacuum dryer.

With the blending completed, the wool is blown to the picker room through a large pipe. There it is run through a machine, that separates the fibers of the material, which has been moistened with a special emulsion to preserve its strength and to make easier the operations of carding and spinning. Again a blast of air picks up the wool at the right moment and carries it through suitable ducts to bins in the card room. Next the wool is delivered to the first section of the carding machine, which picks the fleece apart and removes any foreign substances that may be adhering to the fibers. Then the wool goes over a large cylinder that revolves at high speed and, in combination with several small cylinders that are also covered with fine wire, the fibers are once more picked apart and laid parallel in preparation for spinning into yarn. A Doffer comb, which is set against the large cylinder, serves to give the fibers the form of very loosely assembled sliver. Sliver may be likened to the worsted of the knitter after it has been untwisted and the fibers have been merely intermingled.

From the first section the sliver is laid across rollers to the second section that further refines the wool fibers. The wool then enters the finisher, from which the sliver issues through two leather belts that are run so as to oscillate and to rub the fibers between them and thus produce what is known as roping. The weight of the yarn to be made is determined by the weight of the roping; and so exact are the specifications that the operator is allowed a tolerance of only 3 grains in 100 yards of roping! The significance of this requirement becomes apparent when we recall that there are 7,000 grains in a pound avoirdupois. The roping is wound on to big spools in readiness to be sent to the spinning room there to be spun into yarn by the "mules".

Mules are the wonder machines of modern textile plants. Someone has fittingly remarked that, "A mule does everything but talk". It is not our intention to dwell upon the mechanical details of one of these machines nor to try to describe its complex get-up. It will have to suffice the reader to know that the man in charge of the spinning operation of a mule must, himself, be very expert and capable of adjusting essential parts of the machine so that it will turn out yarn of the given size and also of the required strength. The treatment or handling of yarn for the warp of a felt is somewhat different from that of yarn for the filling of a felt. Again, we shall skip details—mentioning only the fact that very close attention is devoted to maintaining uniform tension in winding the warp yarn on a reel and thence on to a beam in readiness for placing the latter in a loom. The warp is virtually the foundation of a felt—hence the need of uniformity in the characteristics of the yarn. A number of essential and exact steps follow before all is completed preparatory to starting a loom. These steps determine the design of the felt as well as the number of threads to be woven per inch.



1—Close-up of a joining operation. 2—The women in the foreground are inspecting joined felts. 3—Measuring and inspecting a felt which has undergone fulling.

The Albany Felt Company has numerous looms so as to be able to turn out felts for paper-making and for other industrial purposes. Two of these are each capable of weaving felts 488 inches in width or tubular material 77 feet in circumference! There are only four or five large looms of this kind in the United States. The speed of weaving varies with the different machines; but some of the large looms make as many as 23 "picks" a minute—the shuttle moving from side to side that many times every 60 seconds.

From the looms the felts go to the burling room, and there keen-eyed girls examine every inch of the fabric and remove any knots they can find. Where felts have to be joined after weaving, this work is done by women experts. In effect, the operation amounts to hand-weaving carried back far enough from each juncture to insure the needful measure of strength. What this represents can be realized when it is mentioned that some felts, at this stage, have 25 threads to the inch and are, at the time of joining, 200 inches wide. Joiners may have to work five or six days to finish their task on a single felt! When finished, only the sharp eye of the expert can tell where the junction has been made.

The next operation consists of immersing a felt in a fulling solution; and then it is placed in one or two types of fulling machines—depending upon the nature of the felt. The chemical solution and the friction induced by the fulling machine serve to shrink the felt. This work calls for expert judgment on the part of the operator, because he alone can determine when the felt has been sufficiently shrunk. After fulling, the felt is stretched and held taut so that it can be measured precisely; and with this done the felt goes to washers in which the temperature is automatically controlled by air-operated thermostatic apparatus. The washers remove the fulling solution. With the rinsing finished, the felt is generally put in a rotary extractor and the water removed by centrifugal force.

The felt is now shifted to a roller teasel gig carrying numerous dried flower heads from the European teasel. These spiny bodies are arranged so as to engage the surface of the felt and raise a nap. Inspectors at the teasel gig scrutinize both sides of the fabric as it comes from the machine for defects that might have gone unnoticed before. If approved, the felt is run much like a belt around one of several steam-heated cylinder driers which are automatically regulated for temperature. As jackets cannot be handled in this way, a special vacuum drier has lately been developed that dries these heavier materials in from three to five hours instead of an equal number of days, as was once the case. The air pressure in the drying chamber is reduced by means of a vacuum pump, and the temperature is carefully controlled.

Certain felts must be singed on coming from the drier. Each felt is hung on opposed rollers and any surplus fibers or nap is singed off by a series of gas jets fed with compressed gas. The singed material is caught up and carried away by a cleaner operated under a vacuum of from 8 to 10 inches. Finally, the felt is taken to what is known as an inspection perch, and there thoroughly experienced operators carefully measure the felt, to see that it is the right size, and look through it toward the light in quest of any imperfections that might render the fabric unsuited for paper-making. If found perfect, the

Two great newsprint machines in which felts play an indispensable part.

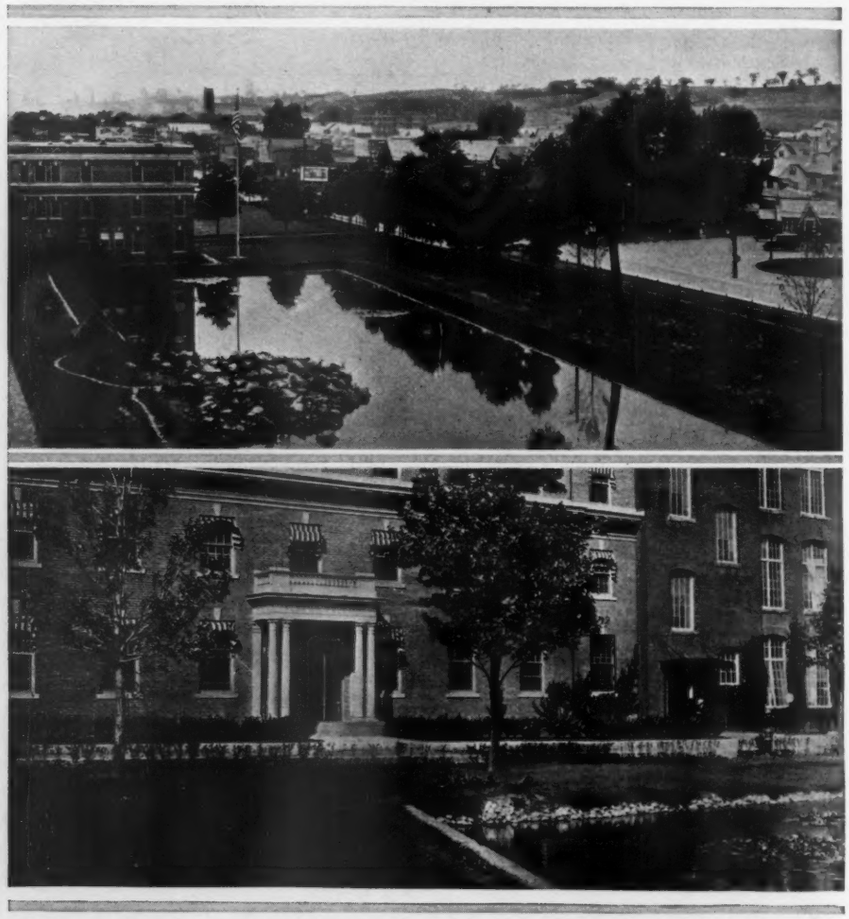
felt either goes into storage, after being made mothproof, or is shipped directly to a customer.

Fully 85 per cent of the plant output consists of felts and jackets for paper machines—the remainder being worked into miscellaneous mechanical woolens that may be used in the tanning of leather, in the finishing of silk, cotton, and worsted goods, in laundries, in printing shops, and in the polishing of brass, rubber goods, and many other commodities. If the point has not been made clear, let us now emphasize the fact that new fleece wool and only new fleece wool is used in the fabrication of Albany felts. How much wool is needed annually in the Albany factory is naturally a question that most of us would ask. We are told that fully 3,000,000 pounds of raw wool are worked up in the course of a year; and the coats from a great many sheep are required to meet this demand.

In an earlier paragraph reference was made to zero-soft water. The utmost care is given to the maintenance of a supply of this degree of softness, and tests are made continually to keep the water in use in this state because only soft water will enable the manufacturer satisfactorily to scour the wool and to wash the felt. Again, nothing short of zero-soft water will induce uniformly those actions that are required to properly shrink a felt for a given service or a prescribed kind of paper-making machine. This subject is mentioned in order to stress another of the numerous niceties that must be observed in this field of manufacture.

Compressors and vacuum pumps have various and indispensable functions to perform in the Albany plant—some of them have already been referred to. In addition to those that have been described, compressed air is utilized extensively in the cleaning of machines and also in making doubly sure that felts are fully equal to the demands that are likely to be made upon them in service. As might logically be expected, the Albany plant is protected against fire by an automatic sprinkler system in which compressed air is employed to hold the water in check until a sufficiently high temperature causes its release. This is known as the dry-pipe system of fire protection.

The office and operating personnel of the Albany Felt Company numbers 375; and this organization is like one big family with every evidence of a community of interest. Most of the departmental heads have been in the employ of the company for years; and in many instances their children and other relatives have joined the force in one capacity or another. Lunch hour brings out this mutuality of interest—most of the employees eating in the excellent cafeteria maintained by the company. A force of gardeners, besides seeing to the ornamental upkeep of the grounds, grows foodstuffs in the open months, and these are generously drawn upon to provide a well-balanced dietary. This is just one more proof of the company's watchfulness over the welfare and well-being of its personnel.



Views of parts of the Albany Felt Company's plant and associate landscaped gardens.

GEORGE REUBEN ELDER

IT is with deep regret that we announce the death on November 29, in Waterford, N. Y., of George Reuben Elder, former general manager of the Easton, Pa., and Phillipsburg, N. J., plants of the Ingersoll-Rand Company and a vice-president and director of the company. Mr. Elder was born on January 11, 1862, in Johnstown, Pa., and was the son of the late Cyrus and Nancy Swank Elder. His father was for many years chief corporation lawyer for the Cambria Iron Company, later the Cambria Steel Company.

In 1881, after four years at Swarthmore Prep and one year at Swarthmore College, in Pennsylvania, Mr. Elder entered the Rensselaer Polytechnic Institute, Troy, N. Y., in the middle of the freshman year, and was graduated in 1884 with the degree of civil engineer. He took a prominent part in school athletics, and was a member of one of the first intercollegiate baseball teams in the country. He was a member of the Delta Kappa Epsilon fraternity.

After graduation Mr. Elder became connected with the Southwark Foundry & Machine Company; and in 1889 became superintendent of the Johnson Company, Johnstown, Pa., makers of railroad switches. Four years later he left that company to take a position with the Ingersoll-Sergeant Drill Company, in New York City. In the fall of 1893 he was made superintendent of that company's West Easton plant, then just completed. Subsequently he became general manager of the Easton and Phillipsburg plants of the Ingersoll-Rand Company, the successor of the Ingersoll-Sergeant Drill Company.

Mr. Elder was an ardent horseman, hunter, and fisherman, and a lover of the outdoors. Until he took up his residence in Waterford five years ago he was a member of Easton's Pomfret Club and Northampton Country Club, and took an active interest in the affairs of the community.

Surviving Mr. Elder are his widow, two children—Mrs. Theodore Sands Fillmore and George R. Elder, Jr., and his sister, Mrs. J. H. Jowett. There was a funeral service in the Waterford home of the deceased, and a second service was performed at Easton, in the home of Mrs. Fillmore, before the interment.

CORRECTION

IN our obituary notice of the late Henry Lang, in the December issue, an error was made in stating that his widow is the daughter of the late Addison C. Rand. Mrs. Lang is the daughter of the late Jasper R. Rand, who was one of the founders of the Rand Drill Company.

ELECTRIC DOUBLE-DRUM HOIST FOR SLUSHING

DOUBLE-DRUM hoists are extensively used today in slushing and drag-line operations in mines and tunnels where conditions are such as to make this method of handling ore or muck feasible. The Lake Superior District was among the first to try out mechanical scraping; and so pronounced were the time and money savings thus made possible that from 90 to 95 per cent of the ore mined there is now moved with hoist-pulled scrapers. What applies to this region is true elsewhere where slushing has been substituted for hand mucking.

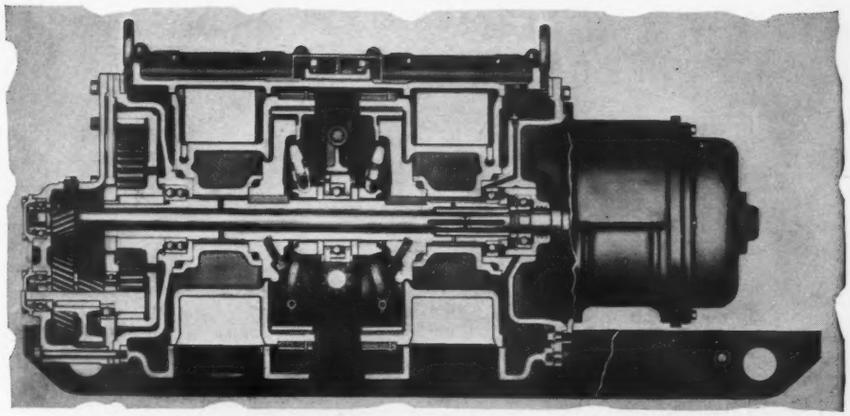
Developments within recent years have made it apparent that hoists of higher speeds and greater capacities than those commonly employed for the purpose are necessary not only to keep pace with operations all along the line but to broaden the scope of slushing. To meet these service demands the Ingersoll-Rand Company, 11 Broadway, New York City, has added to its line of products a 15-hp. double-drum electric hoist for slushing that is rugged in construction, quiet in operation, and embodies a number of other distinctive features. Unless otherwise specified, the hoist is provided either with a 220-240 volt alternating-current motor or a 230-250 volt direct-current motor both of standard make and especially designed for direct "across-the-line" starting, with ample overload capacity, and for cool operation under severe conditions.

Other considerations in a hoist for slushing are compactness and portability, requirements that the new Size 215 hoist meets satisfactorily. Without rope guides, it will pass through a 25x25-inch opening; and it is said to be the only electric slusher hoist with its motor, gearing, and drums contained in a single cylindrical housing that insures perfect alignment of all the parts and fully protects them against dirt and moisture. Auxiliaries such as cable guide, clutch, and brake brackets are bolted to the hoist. The entire unit is mounted on sturdy steel skids—an outstanding improvement in slusher-hoist construction. These not only prevent wracking the hoist but facilitate moving it—in fact, make it possible for the hoist to pull itself along on level stretches.

The Size 215 hoist has a rated vertical lifting capacity or rope pull of 2,000 pounds at an average cable speed of 240 feet per minute. Both "pull" and "tail" cables can be wound over or under the drums, as desired; and in reeling on or off the drums they pass through guide rollers mounted on Timken roller bearings. Each drum carries either 300 feet of ½-inch cable or 500 feet of ⅜-inch cable.

Except when mounted on a slide for loading cars, when end control is required, the new hoist is controlled by a standard clutch lever at the rear. This operates both drums through two internal, expanding clutches, one for each drum. The arrangement is such that only one clutch or drum can be engaged at a time, and the hoist, therefore, cannot become locked. The clutches are of the friction type and permit taking the load on gradually or handling it at maximum speed from the start.

The manufacturer has given a detailed description of this new product in Bulletin No. 1860, which may be obtained free upon request by those interested.



Longitudinal section of the hoist showing general arrangement of the mounting and working parts.

COMMITTEE TO DETERMINE STRESS VALUES OF TIMBER

ONE of the most perplexing problems that the lumber and building industries have had to contend with in the past is in a fair way to be cleared up by the recently appointed subcommittee of the National Committee on Wood Utilization, the Timber Stress Committee. The aim of this body is to provide definite data on the strength properties of various species of wood. There are more than 100 different species in the United States alone, and each has its own peculiar characteristics and qualities with which the consumer should be familiar in order to put the material to the most effective and economical use. However, only a few of the most important varieties are commonly used for structural purposes, where stress values play an essential part.

The Government, through its Forest Products Laboratory, has made hundreds and thousands of tests so that there is already available a mass of information on the working stresses of different basic grades of different kinds of timber. This stress data, unfortunately, is not applicable in most instances to lumber as now graded—producers during recent years having made certain changes in grades to adapt their products to specific needs. It is for the purpose of interpreting and applying the stress data developed by the Forest Products Laboratory to standard grades of lumber that the Timber Stress Committee has been formed.

Slushing ore into a raise in an iron mine with the aid of the new Size 215 electric double-drum hoist. The strong steel skid mounting offers a firm foundation when spragging the hoist and prevents springing the housing.

Lumber users are learning more and more to appreciate the value of creosoted lumber, as is evidenced by the 1929 figures recently given out by the United States Forest Service and the American Wood Preservers Association. Nearly 9 per cent more timber was treated that year than in 1928, or a total of 362,009,047 cubic feet. Approximately 90 per cent of this wood was creosoted by pressure processes. The savings to be effected by thus offsetting deterioration and decay cannot be overestimated; and we have been told only lately that moisture and insect pests damage ordinary frame structures in the United States to the tune of $45,000,000 annually.

COAL DUST MAKES SATISFACTORY WASH FOR MOLDS

A WASH consisting mostly of coal dust instead of lime is being used at the Ironton, Utah, plant of the United States Steel Corporation to spray mold surfaces preparatory to making castings. As a result, the company's lime bill for this department has been cut considerably. The special solution is made up of about 75 per cent of coal dust, 25 per cent of lime, and a proportionate amount of water. While tests proved conclusively that coal dust alone produces an entirely satisfactory facing, still the lime had to be added to lighten the color of the wash so that it would be plainly visible at night—it being important that the mold surfaces be thoroughly covered.

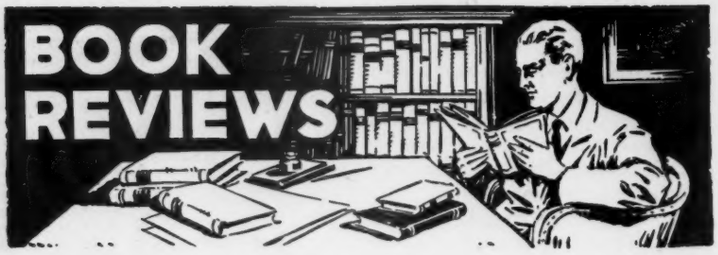
The coal dust for this purpose is taken directly from the crushing plant by suction induced by a small fan. The fine material thus drawn from the hammer mill is deposited in a closed sheet-iron hopper. This hopper has a discharge gate at the bottom to facilitate the sacking of the volatile dust.

BERYLLIUM DEPOSIT UNCOVERED IN IDAHO

AN announcement of considerable importance to the mineral world has come from Latah County, in northwestern Idaho, and, if it be true, that State, already an outstanding mineral producer in the United States, will take on added significance. A rich strike of beryllium ore is said to have been made eight miles from Deary; and assays have shown the ore to contain as high as 10 per cent of the metal in crystals ranging from minute particles to large 6-sided pieces 10 inches through in cross section.

The report is of especial interest at this time, coming as it does right on the heels of the discovery of what is declared to be a very extensive deposit of beryllium in the Styrian Alps, Austria. Heretofore, this metal has been available in only limited quantities, and has been quoted as high as $200 a pound. The two deposits lately uncovered are therefore calculated to take beryllium out of the rare-metal class and to make an abundance of it available for the production of lightweight alloys especially for airplane construction.

Joints in concrete roads are under investigation in England, where the Ministry of Transport, in collaboration with the County Surveyor of Surrey, has laid down an experimental stretch of highway between Hampton Court and Esher. It has a length of 480 yards and a width of 42 feet, and is made up of 144 reinforced slabs each 20 feet long, 21 feet wide, and 9 inches thick. The transverse joints are being run from the curb at angles of 90°, 80°, and in some cases 75°, and include a plain butt joint, a butt joint with granolithic arrises, a vee joint, two forms of tongue-and-groove joints, a sleeper joint, and a steel-dowel joint. The matter under consideration is an important one, and the findings should be of interest to roadbuilders generally.



PETROLEUM ENGINEERING HANDBOOK, 1930 edition. A copiously illustrated work of 496 pages, published by the Petroleum World, Los Angeles, Calif. Price, $5.00.

THIS annual handbook is always welcomed eagerly by the entire fraternity interested in the mining, the refining, and the distribution of petroleum and its multiple products. Each subject has been treated by an expert in that particular department of the industry; and each writer has been left free to deal with his topic without restraint of any sort. Differences of opinion are entertained regarding some of the subjects presented, and the authors give their own views of the respective topics. Accordingly, the publisher does not necessarily endorse the views of all the associated authors nor does he accept responsibility for them even though he gives publicity to them.

Despite the fact that there are necessarily some controversial aspects to the subjects discussed, still most of the pages contain a wealth of information about which there is general agreement in the industry; and wellnigh every topic is handled in an understandable manner and often in an entertaining one. The book brings out in a forceful way how far the mining of petroleum and its subsequent treatment have advanced within the last quarter of a century. Increasing skill and greater precision are required now at every turn, while efficiencies are insisted upon so that operating economies and reasonable profits can be assured. Petroleum touches our daily life in a measure undreamed of by the public at large. This is brought out in many directions by the articles in this excellent handbook.

THE MARKS OF AN EDUCATED MAN, by Albert Edward Wiggam, D.Sc. A work of 339 pages, published by Bobbs-Merrill Company, Indianapolis, Ind. Price, $3.00.

IN this very readable volume the author has striven simply to make education appear worth while and within the reach of the humblest. As he puts it: "I am convinced that, without any increase in our natural abilities, we could all be much better educated than we are and consequently much happier and more useful." He develops his thesis by describing in an interesting manner just what so many fo us can do to round out our equipment and to give ourselves the really desirable marks of an educated man. The book has much to commend it.

THE ROAD TO PLENTY, by William Trufant Foster and Waddill Catchings. A book of 229 pages, published for the Pollak Foundation for Economic Research by Houghton Mifflin Company, Boston, Mass. Price, 75 cents.

ANYBODY with the price at his disposal, and not desperately in need of mere bread, can profitably spend 75 cents for a copy this book. We do not conclude, and t authors probably do not claim, that the p usal of its pages will reveal a complete so tion of the problem of unemployment wh confronts us at well-nigh every turn. On t other hand, Messrs. Foster and Catchi have given us an extremely simple and lu presentation of some vital phases of economic life. At the same time, they h advanced a suggestion which is fundamen in its importance: they bring us face to f with the fact that each and all of us can our part to wipe out unemployment by rec nizing the contributing conditions to be cially universal in their origin and helping correct them.

STRATEGY IN HANDLING PEOPLE, by Ewing T. Webb John J. B. Morgan. An illustrated book of 260 p published by Boulton, Pierce & Company, Chicago, Price, $3.00.

HERE is a book written by a manager advertising campaigns and a profes of psychology. Together, the authors t interesting stories about many public m and others that have shone or still shine times for one reason or another. The objec of course, is to reveal how each of these figur has shown his ability to handle people how some lesser light has won his point making these greater bodies respond to hi Successful men as a rule make an appeal others for one or more characteristic reason and it is possible to acquire in a manner measure the same power of appeal through grasp of the underlying principles and the application—skill and finish coming on with practice. It means the exercise of huma understanding and the strategy of psycholog

The Flow of Air Through Circular Orifi with Rounded Approach is the title of Bulle No. 207 issued by the Engineering Exper ment Station, University of Illinois, Urban Ill. This illustrated publication of 52 pag is sold for 30 cents a copy. The authors a Messrs. Joseph A. Polson, Joseph G. Lo ther, and Benjamin J. Wilson.

Mineral Resources of Alaska, 1927, is t title of Geological Survey Bulletin 810, i sued by the United States Geological Surve Washington, D. C., and purchasable fro the Superintendent of Documents. Pric 50 cents. The bulletin contains much valuab information and recounts the progress ma in investigating the mineral wealth of o great northwestern territory.